Consultation Number: F/NWR/2005/00388

Biological Opinion on Impacts of Treaty Indian and Non-Indian Fisheries in the Columbia River Basin in Years 2005-2007, on Salmon and Steelhead Listed Under the Endangered Species Act, Conference on Lower Columbia Coho, and Magnuson-Stevens Act Essential Fish Habitat Consultation.

Action Agency: National Marine Fisheries Service (NMFS)

Species/Evolutionarily Significant Units Affected:

Species	Evolutionarily Significant Unit	Present Status	Federal Register Notice	
Chinook Salmon (*O. tshawytscha*)	Snake River Fall Snake River Spring/Summer Lower Columbia River Upper Willamette River Upper Columbia River Spring	Threatened Threatened Threatened Threatened Endangered	57 FR 14653 57 FR 14653 64 FR 14308 64 FR 14308 64 FR 14308	4/22/92 4/22/92 3/24/99 3/24/99 3/24/99
Chum Salmon (*O. keta*)	Columbia River	Threatened	64 FR 14570	3/25/99
Sockeye Salmon (*O. nerka*)	Snake River	Endangered	56 FR 58619	11/20/91
Coho Salmon (*O. kisutch*)	Lower Columbia River	Proposed as Threatened	69 FR 33102	6/14/04
Steelhead (*O. mykiss*)	Upper Columbia River Snake River Basin Lower Columbia River Upper Willamette River Middle Columbia River	Endangered Threatened Threatened Threatened Threatened	62 FR 43937 62 FR 43937 63 FR 13347 64 FR 14517 64 FR 14517	8/18/97 8/18/97 3/19/98 3/25/99 3/25/99
Bull Trout (*S. confluentus*) [1]	N/A	Threatened	63 FR 31647	6/10/98

[1] Species managed by the U.S. Fish and Wildlife Service

Activities considered: To conduct fisheries proposed from 2005-2007 in the Columbia River Basin by the States of Oregon and Washington, the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Yakama Indian Nation.

Consultation conducted by: NMFS, Sustainable Fisheries Division, Northwest Region. Consultation Number:

The *U.S. v Oregon* parties propose to enter into a three year agreement regarding the Columbia River fisheries (*U.S. v Oregon* Parties 2005). In this biological opinion, NMFS reviews information regarding the impacts to ESA listed fish associated with the proposed fisheries. The Incidental Take Statement describes the amount of take expected to occur as the result of the proposed fisheries. This biological opinion has been prepared in accordance with section 7 of the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 et seq.). A complete administrative record of this consultation is on file with NMFS, Sustainable Fisheries Division in Seattle, Washington.

Approved by: D. Robert Lohn **Date:** 5/9/05

D. Robert Lohn, Regional Administrator

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INTRODUCTION

The National Marine Fisheries Service (NMFS) is required under section 7 of the Endangered Species Act (ESA) to conduct a consultation that considers the the effects of the proposed *U.S. v. Oregon* Columbia River fisheries on ESA-listed species. The proposed fisheries are to be conducted pursuant to the 2005-2007 Interim Management Agreement for Upper Columbia River Chinook, Sockeye, Steelhead, Coho and White Sturgeon (*U.S. v. Oregon* Parties 2005). The parties to the 2005-2007 Interim Management Agreement are: the States of Oregon, Washington and Idaho, the Nez Perce Tribe, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Yakama Indian Nation, the Shoshone-Bannock Tribes, the Bureau of Indian Affairs, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (hereafter "Parties.") The Parties have tentatively completed an Interim Agreement. However, NMFS's final approval requires that they complete a section 7 consultation on the proposed Agreement and conclude that the proposed fisheries are not likely to jeopardize any ESA-listed species. Once the Interim Agreement is finalized, the parties intend to enter it as a court order under *U.S. v. Oregon*.

This biological opinion considers the effects on listed species of fisheries proposed in the Agreement, except for fisheries affecting listed winter steelhead and Lower Columbia River coho. Fisheries affecting listed winter steelhead in 2005 were considered in an earlier biological opinion in January 2005 (NMFS 2005). Because the states' proposal for managing winter steelhead after 2005 is unclear, NMFS will reinitiate consultation for 2006 and 2007 prior to the 2006 fishing season. This is discussed in more detail in the following section. Lower Columbia River coho salmon are proposed for listing as threatened under the ESA and may be affected by the proposed fisheries. NMFS is therefore also conducting a conference pursuant to section 7 of the ESA regarding the impacts of proposed fisheries on Lower Columbia River coho salmon. For fisheries affecting Lower Columbia coho, this ESA conference is for 2005 only. If Lower Columbia coho become listed under the ESA, NMFS would consult on 2006 and 2007 Columbia River fisheries. The ESA listed species in the action area that are potentially affected by the proposed fisheries are listed in Table 1.

CONSULTATION HISTORY

Fisheries in the Columbia River basin were managed subject to provisions of the Columbia River Fish Management Plan (CRFMP) from 1988 through 1998. The CRFMP was a stipulated agreement adopted by the Federal Court under the continuing jurisdiction of *U.S. v Oregon*. NMFS has consulted under section 7 of the ESA on proposed fisheries in the Columbia basin since 1992 when affected salmonids were first listed. The *U.S. v Oregon* Technical Advisory Committee (TAC) routinely prepared biological assessments for proposed fisheries that were submitted to NMFS through the U.S. Fish and Wildlife Service (USFWS). The TAC biological assessments considered treaty Indian and non-Indian fisheries within the jurisdiction of the CRFMP, with the exception of Idaho fisheries in the Snake River Basin, which were considered separately under section 10 of the ESA.

Table 1. Summary of salmonid species from the Columbia River basin listed under the Endangered Species Act. All Evolutionarily Significant Units (ESUs) are potentially affected by the proposed action.

Species	Evolutionarily Significant Unit	Present Status	Federal Register Notice	
Chinook Salmon (*O. tshawytscha*)	Snake River Fall	Threatened	57 FR 14653	4/22/92
	Snake River Spring/Summer	Threatened	57 FR 14653	4/22/92
	Lower Columbia River	Threatened	64 FR 14308	3/24/99
	Upper Willamette River	Threatened	64 FR 14308	3/24/99
	Upper Columbia River Spring	Endangered	64 FR 14308	3/24/99
Chum Salmon (*O. keta*)	Columbia River	Threatened	64 FR 14570	3/25/99
Sockeye Salmon (*O. nerka*)	Snake River	Endangered	56 FR 58619	11/20/91
Coho Salmon (*O. kisutch*)	Lower Columbia River	Proposed as Threatened	69 FR 33102	6/14/04
Steelhead (*O. mykiss*)	Upper Columbia River	Endangered	62 FR 43937	8/18/97
	Snake River Basin	Threatened	62 FR 43937	8/18/97
	Lower Columbia River	Threatened	63 FR 13347	3/19/98
	Upper Willamette River	Threatened	64 FR 14517	3/25/99
	Middle Columbia River	Threatened	64 FR 14517	3/25/99
Bull Trout (*S. confluentus*) [1]	N/A	Threatened	63 FR 31647	6/10/98

[1] Species managed by the U.S. Fish and Wildlife Service

Fall season fisheries in the Columbia River basin were managed from 1996-1998 under provisions of the 1996-1998 Management Agreement for Upper Columbia River fall Chinook. This fall season management agreement modified provisions of the CRFMP to include specific guidelines for the management of Snake River fall Chinook. NMFS issued a biological opinion on the fall season fisheries under the terms of the three year agreement in March 1996 (NMFS 1996a). NMFS then reinitiated consultation in 1998 to consider additional management measures for the protection of newly listed steelhead species and issued a biological opinion that covered just the 1998 fall season fisheries (NMFS 1998a).

The CRFMP expired on December 31, 1998, but was extended by court order through July 31, 1999. The Plan expired thereafter. The 1999 fall season fisheries were managed pursuant to a one-year agreement between the state, tribal and Federal parties to *U.S. v Oregon*. The proposed state and tribal fisheries in the1999 management agreement were considered in a section 7 consultation. The Federal government's participation in that agreement was the Federal action that provided the necessary nexus for consultation under section 7 of the ESA.

In 2000, the consultation processes leading up to the winter, spring, and summer season, and later to the fall season fisheries, were initially unclear. At the outset there was no agreement among the parties regarding fisheries under *U.S. v. Oregon*, particularly with respect to allocation amongst the Parties. Absent an agreement or other recognizable Federal action, there was no nexus for authorizing proposed state fisheries under section 7, and NMFS advised the states of Oregon and Washington that they should apply for a section 10 permit. Although the states disagreed with NMFS on the question of nexus for the state fisheries, they nonetheless submitted two section 10 permit applications: One for consideration of their winter, spring, and summer season fisheries, and another one for consideration of their fall season fisheries in 2000 (Greer and Koenings 2000a, Greer and Koenings 2000b). In 2000 the Bureau of Indian Affairs initiated section 7 consultation on behalf of the tribes by providing biological assessments to NMFS regarding the tribes' proposed winter, spring, and summer season fisheries (Speaks 1999), and fall season fisheries (Jamison 2000). The state and tribal fishery proposals for both, winter, spring, and summer, and the fall seasons in 2000 were initially analyzed separately using the section 7 and 10 processes. However, prior to completion of the consultations, the Parties resolved outstanding issues and concluded annual agreements regarding management of the fisheries (*U.S. v Oregon* Parties 2000a and 2000b). The Agreements among the state, tribal, and Federal parties in 2000 provided a nexus for NMFS' consideration of the combined state and tribal fisheries through a single section 7 consultation for the winter, spring, and summer season, and for the fall season fisheries. NMFS issued biological opinions under Section 7 of the ESA for winter, spring and summer season fisheries in 2000 (NMFS 2000a), and for fall season fisheries in 2000 (NMFS 2000b).

For winter, spring, and summer season fisheries in 2001, the BIA provided a biological assessment on behalf of the four Columbia River tribes describing proposed tribal fisheries for 2001 (Speaks 2000). The States applied for a permit to incidentally take listed species, pursuant to section 10(a)(1)(B) of the ESA, to cover the suite of state winter, spring, and summer season fisheries for 2001 (Tweit and Norman 2000). Initially, the state and tribal fisheries were again analyzed separately using the section 7 and 10 processes. However, prior to completion of the consultation, the Parties reached a five-year Interim Management Agreement in 2001 (*U.S. v Oregon* Parties 2001). The Agreement among the state, tribal, and Federal parties for winter, spring, and summer season in 2001-2005 provided a nexus for NMFS' consideration of the combined state and tribal fisheries through a single section 7 consultation (NMFS 2001a). The 2001 Agreement, or portions thereof, remain in effect through 2005, and potentially beyond so long as fisheries are managed consistent with the terms of the Agreement.

For fall season fisheries, the situation in 2001 was similar to that of 2000. Initially, the state and tribal fisheries were analyzed separately using the section 7 and 10 processes. However, prior to completion of the consultation process, the *U.S. v Oregon* parties resolved outstanding issues and concluded an annual agreement regarding management of the 2001 fall season fisheries (*U.S. v Oregon* Parties 2001b). This agreement among the state, tribal, and Federal parties for fall season fisheries in 2001 provided a nexus for NMFS' consideration of the combined state and tribal fisheries through a single section 7 consultation (NMFS 2001b).

In 2002 and 2003, the parties concluded agreements each year regarding the fall season fisheries, which are described in the 2002 and 2003 biological assessments prepared by TAC (LeFleur 2002 and 2003). The 2002 and 2003 management agreements (*U.S. v Oregon* Parties 2002, and 2003) among the state, tribal, and Federal parties provided a nexus for NMFS' consideration of the proposed fisheries under section 7 of the ESA. NMFS issued biological opinions for fall season fisheries in 2002 and 2003 under section 7 of the ESA (NMFS 2002, NMFS 2003a)

Winter, spring, and summer season fisheries in 2004 were managed according to the provisions of the 2001 biological opinion (NMFS 2001a). In 2004, the states submitted a proposal to modify management provisions and the resulting incidental take of listed winter steelhead (LeFleur and King 2004) for 2004 and 2005. However, because of questions and the need for ongoing consultation, NMFS did not complete the consultation, in the form of a supplemental opinion until January 6, 2005 (NMFS 2005). The revised management provisions therefore applied only to the 2005 season. The winter, spring, and summer season fisheries in 2005 are currently being managed under the provisions the 2001 biological opinion (NMFS 2001a), as modified by the 2005 supplemental biological opinion on listed winter steelhead (NMFS 2005). The 2001 opinion and the 2005 supplemental opinion therefore continue to provide the necessary take exemptions for the winter and spring 2005 fisheries.

For the fall 2004 season fisheries, the parties negotiated a one-year management agreement regarding, which are described in the 2004 biological assessment prepared by TAC (LeFleur 2004). The 2004 management agreement (*U.S. v Oregon* Parties 2004) among the state, tribal, and Federal parties provided a nexus for NMFS' consideration of the proposed fall season fisheries under section 7 of the ESA. NMFS concluded its consultation on fall season fisheries on August 6, 2004 (NMFS 2004a).

In 2005, the parties negotiated a three-year (2005-2007) management agreement regarding the *U.S. v. Oregon* fisheries, which are described in detail in the 2005 biological assessment prepared by TAC (LeFleur 2005a, LaFleur 2005b). The 2005-2007 Interim Management Agreement (*U.S. v Oregon* Parties 2005) among the state, tribal, and Federal parties provides a nexus for NMFS' consideration of the proposed fisheries under section 7 of the ESA. The following biological opinion considers the effects of the *U.S. v. Oregon* Interim Management Agreement for 2005-07 on listed salmonid ESUs in the Columbia River Basin. The 2001 opinion and the 2005 supplemental opinion continue to provide the necessary take exemptions for winter and spring fisheries in 2001. The Parties intend that this opinion on the Interim Agreement supercede the 2001 opinion once it is complete.

As mentioned briefly above, there are two aspects of the proposed fisheries that will require future consideration during the term of the Agreement. The states of Oregon and Washington have struggled with their fishery proposal as it relates to the effects on listed winter steelhead populations. (Note that there are three ESUs that include winter steelhead populations, including the Upper Willamette River, Lower Columbia River, and Middle Columbia River steelhead ESUs.) The states proposed modifications of the biological opinion on the 2001 Interim Agreement related to a proposed increase in the allowable incidental harvest rate of listed steelhead from 2% to 6% for 2004 and 2005. The consultation was not completed prior to the 2004 season, but was approved for the 2005 season in a supplemental biological opinion (NMFS 2005). Subsequent to NMFS' approval, the states Fish and Wildlife Commissions met to make a final policy decision on winter steelhead harvest rates for 2005. The Washington Commission approved a harvest rate of 4%, but the Oregon Commission decided that the harvest rate limit should be kept at 2%. So, despite the states request for consideration of the proposed increase and NMFS' subsequent approval of a 6% harvest rate for 2005, in the end the states, for policy reasons, decided not to implement the proposed increase. Further, the states did not clarify in the biological assessment how they propose to manage winter steelhead impacts in 2006 and 2007. The 2005 supplemental biological opinion provides the necessary take exemptions for winter steelhead for the 2005 fishery until it is presumably superceded by this biological opinion on the 2005-07 Interim Agreement. However, the states will have to reinitiate consultation to clarify how they propose to manage fisheries for winter steelhead prior to the 2006 winter season.

NMFS may also have to consider further the effects of the Interim Management Agreement on Lower Columbia River coho. Lower Columbia River coho are currently proposed for listing and are therefore the subject of a conference opinion, which is incorporated here. Given the circumstances, NMFS analyzed the effects of proposed fisheries for 2005 only. If Lower Columbia River coho are subsequently listed under the ESA, NMFS will reinitiate consultationto consider the effects on Lower Columbia River coho prior to the 2006 fall fishing season.

RELATION TO 2004 FCRPS CONSULTATION

The status of harvest considered in this action relative to the environmental baseline requires some explanation. In the recent FCRPS biological opinion (NMFS 2004c) NMFS concluded that treaty Indian fishing rights were included in the environmental baseline for the purposes of that consultation. In that opinion, NMFS provided the basis for that conclusion (see section 5.3.6 in NMFS 2004c in particular) and elaborated on the complications associated with anticipating and quantifying what treaty fishing rights would be in the future. Among other things the opinion said:

> "Annual calculations of allowable harvest rates depend (among other things) on estimated run sizes for the particular year, on the mix of stocks that is present, on application of the ESA to mixed-stock fisheries, on application of the tenets of the "conservation necessity principle" to regulation of treaty Indian fisheries, and on the effect of both the ESA and the conservation necessity principle on treaty and non-treaty allocations. While the precise quantification of treaty Indian fishing rights during a particular fishing season often cannot be established by a rigid formula, the treaty fishing right itself continues to exist and must be accounted for in the environmental baseline."

The FCRPS opinion goes on to explain that quantification of the right in a particular year is subject to negotiation in U.S. v. Oregon, and provides a brief history of the court approved settlement agreements that have provided the basis for NMFS' related ESA Section 7 consultations. (The sequence of agreements and consultations is explained in more detail in the preceding subsection of this opinion.) The FCRPS opinion then explains the status of current harvest agreements and the extent to which future fisheries have been considered through existing opinions (see section 5.3.6 and Appendix C in NMFS 2004c for more detail). At the time (fall of 2004) there was a Spring Agreement entered into in 2001 that set harvest rates for Columbia River spring season fisheries through at least 2005, and a 2004 Fall Agreement that set harvest rates for Columbia River fall season fisheries only through 2004. Finally, the opinion noted that the parties were currently negotiating a new long-term agreement, under the Court's direction and supervision that was expected to replace the prior agreements. The 2005 – 2007 Interim Management Agreement considered in this opinion is the successor agreement that was anticipated in the FCRPS opinion. Absent information to the contrary NMFS presumed in the FCRPS opinion that harvest rates in the future would be similar to those allowed under the 2001 Spring and 2004 Fall agreements. The 2005 – 2007 Agreement does in fact carry forward all of the essential ESA related constraints from the prior agreements.

So, although the fisheries considered in this opinion were treated as part of the environmental baseline in the FCRPS opinion, they have not been subject to prior consultation. Fisheries considered in the 2005 – 2007 Agreement, and those subject to future agreements, therefore must be evaluated through Section 7 consultation to make a jeopardy determination.

BIOLOGICAL OPINION

1.0 DESCRIPTION OF THE PROPOSED ACTION

1.1 Proposed Action

The Federal action considered in this biological opinion is NMFS' signing of the *U.S. v. Oregon* Interim Management Agreement for 2005-07 and issuance of the Incidental Take Statement associated with this biological opinion. The treaty Indian and non-Indian fisheries proposed by the Parties extend from January 1, 2005 to December 31, 2007 and operate in the Columbia River mainstem from its mouth upstream to the Wanapum Dam and to Lower Granite Dam on the Snake River, plus the Clearwater River in Idaho State.

1.2 Discussion of change of spring and summer management periods

Under the 2001-2005 Interim Management Agreement and previous agreements, the Snake River and upriver spring Chinook, and the Snake River and upriver summer Chinook were managed as separate units during the spring and summer management periods. In 2003, TAC analyzed the run timing of spring and Snake River spring/summer Chinook salmon using PIT tag data. TAC determined that, based on 2001-2003 run timing, 96 % of upriver spring and Snake River spring/summer Chinook have passed Bonneville by June 15. In other words, TAC learned that the timing of Snake River summer Chinook is earlier and better grouped with the other spring-run fish. TAC therefore proposed modifying the spring and summer management periods so that Snake River spring/summer Chinook could be included in the spring management period. TAC proposed changing the spring management period from an end date of May 31, to an end date of on June 15. By adjusting the spring/summer separation date to June 15 to better reflect the run-timing of listed summer populations of the Snake River spring/summer-run Chinook ESU, there is additional fishing opportunity on unlisted upriver summer Chinook which apparently have later timing and can be targeted in summer season fisheries.

As part of the 2005-07 Interim Management Agreement, a modified spring management period harvest rate schedule was developed. The goal in developing the harvest rate schedule was to maintain harvest rates consistent with the 2001-2005 Interim Management Agreement while accounting for the adjusted management period. This was done by adjusting the breakpoints by approximately 8%, which accounts for the average percent of the run passing Bonneville in the June 1-15 timeframe. Since including additional days in the management period will mean larger dam counts and thus larger run sizes, it was necessary to raise the harvest breakpoints by an appropriate amount to maintain constant relative harvest rates between the two management systems. So, for example, under the 2001 Agreement, a harvest rate of 9% was allowed on a runsize of 75,000. Under the 2005-2007 Agreement, the runsize breakpoint for a 9% harvest rate is 82,000

By making this change in the management framework, and managing Snake River spring/summer Chinook together, run reconstructions should be more accurate, leading to improved assessment of stock status and more accurate measurements of impacts on listed fish.

The Upper Columbia River summer Chinook run is not listed under the ESA. While not as abundant as fall Chinook runs, there have been harvestable numbers of summer Chinook in recent years.

In the 2005-2007 Interim Management Agreement, the U.S. v Oregon parties identified an interim escapement goal of 29,000 Upper Columbia River summer Chinook at the river mouth. The goal includes both natural escapement and hatchery broodstock needs. Based on this goal, a harvest rate schedule was devised that allows for minimal fisheries below the goal and shares treaty Indian and non-Indian harvest above the goal. At run sizes over 50,000, additional fish are passed to escapement areas to probe system productivity and capacity, thereby assisting in refining the escapement goal over time. By changing the management time periods, both treaty Indian and non-Indian fishers will have increased access to harvestable Upper Columbia summer Chinook. This will provide both social and economic benefits to Indian and non-Indian communities.

1.2.1 Description of Non-Indian Fisheries

Non-Indian fisheries addressed in this biological opinion include mainstem sport fisheries for salmonids from Buoy 10 upstream to Priest Rapids Dam, commercial fisheries for salmon and sturgeon from the Columbia mouth to Bonneville Dam including Select Area Fishery Evaluation (SAFE) fisheries. These fisheries occur in the winter/spring management period, the summer management period, and the fall management period. Wanapum tribal fisheries are also included. Additional fisheries include sport sturgeon and warmwater fisheries from the Columbia mouth to Priest Rapids Dam, Ringold sport fishery, commercial carp fisheries above Bonneville Dam, and various fishery-monitoring activities (Table 2).

Columbia River fisheries would be managed according to the 2005-2007 Interim Management Agreement (*U.S. v Oregon* Parties 2005), and in accordance with the Willamette Spring Chinook Fishery Management and Evaluation Plan (FMEP) as described below (ODFW 2001).

Fishery Management and Evaluation Plan For Willamette Spring Chinook

Prior to the 2001 spring season, the Oregon Department of Fish and Wildlife submitted a Fishery Management and Evaluation Plan (FMEP) regarding Willamette spring Chinook to NMFS for consideration under section 4(d) of the ESA. NMFS approved the FMEP on February 9, 2001 (NMFS 2001c). The FMEP set forth wild Willamette River spring Chinook freshwater harvest rate limits of 20 percent for 2001 and 15 percent for 2002 and beyond. The FMEP addresses impacts associated with sport fisheries occurring in the Willamette River Basin and sport and commercial fisheries occurring in the mainstem Columbia River. In addition to the harvest rate limits, the FMEP also requires that all wild Willamette River spring Chinook landed in freshwater fisheries be released. Provisions of the FMEP are incorporated into the 2005-07 Interim Management Agreement. In accordance with the FMEP, sport and commercial fisheries occurring in 2005-2007 would be managed such that cumulative freshwater impacts from sport and commercial fisheries would not exceed 15 percent on wild spring Chinook salmon destined for the Willamette River. Additionally, all wild Willamette spring Chinook salmon landed in 2005-2007 sport and commercial fisheries in the mainstem Columbia and Willamette rivers would be released.

A detailed description of non-Indian fisheries is included in the biological assessment submitted by TAC (LeFleur 2005a, LeFleur 2005b), and is incorporated here by reference.

1.2.2 Description of Treaty Indian Fisheries

The treaty Indian fisheries analyzed in this biological opinion (Table 3) would occur between January 1, 2005 and December 31, 2007 and would include:

- All mainstem Columbia River fisheries between Bonneville Dam and McNary Dam (commonly known as Zone 6 –Figure 1),
- All mainstem Columbia River fisheries upstream of McNary Dam to Wanapum Dam (commonly known as the Hanford Reach Area), and all fisheries within tributaries above Bonneville Dam except in the Snake River Basin,
- All fall, winter, and early spring season steelhead fisheries in the Clearwater River.

A detailed description of treaty Indian fisheries is included in the biological assessment submitted by TAC (LeFleur 2005a, LeFleur 2005b), and is incorporated here by reference.

Allocation Provisions

The treaty share is 50 percent of the harvestable surplus. In recent years, the tribal fall season fisheries have achieved substantially less than the 50 percent of either the Chinook or steelhead harvestable surplus. TAC annually calculates fall Chinook harvestable shares as part of the fall season fishery modeling using agreed to methods. The tribes calculate the steelhead harvestable shares. While it is not possible to estimate harvestable shares in advance of the forecasts being made, based on recent history, it is not likely that the tribal fisheries would achieve either 50 percent of the fall Chinook or steelhead harvestable surplus in 2005-2007. The tribal fisheries in 2005-2007 would likely continue to represent a substantial harvest reduction from the legal treaty share and a continued sacrifice on the part of tribal fishers.

Table 2. Proposed Non-Indian Fisheries. Fisheries. [1]

Fishery	Season
Commercial Sturgeon/Salmon Fishery	Winter/Spring
	Summer
	Fall
Commercial Select Area (SAFE) Fisheries	Winter/Spring
	Summer
	Fall
Commercial Smelt Fishery	
Sport Smelt Fishery	
Sport Salmon/Steelhead Fisheries	Winter/Spring
	Summer
	Fall
Sport SAFE Salmon/Steelhead Fisheries	Winter/Spring
	Summer
	Fall
Sport Salmon/Steelhead Fisheries (Dip-in)	Fall
Commercial Shad Fishery	Summer
Sport Shad Fishery	
Sport Warmwater Fishery	
Commercial Anchovy/Herring Fishery	
Commercial Carp Fishery	
Wanapum Tribal Fishery	Winter/Spring
	Summer
	Fall
Sturgeon Research	Winter/Spring
	Summer
	Fall

[1] The fisheries shown in **bold** are not expected to impact to ESA listed species.

1.3 Action Area

For purposes of this biological opinion, the action area encompasses the Columbia River from its mouth upstream to the Wanapum Dam, including its tributaries (with the exception of the Willamette River since no fisheries are proposed for the Willamette under the Agreement), and to Lower Granite Dam on the Snake River, plus the Clearwater River in Idaho State. The action area therefore includes portions of the states of Washington, Oregon, and Idaho.

Table 3. Proposed Treaty Indian fisheries. [1]

Fisheries	Season
Platform/Hook and Line Fishery	Winter/Spring
	Summer
	Fall
Ceremonial Permit Fishery	Winter/Spring
	Summer
	Fall
Subsistence Permit Fishery	Winter/Spring
	Summer
	Fall
Commercial Salmon/Steelhead Fishery	Winter/Spring
	Summer
	Fall
Commercial Sturgeon Setline Fishery	**Winter/Spring**
	Summer
	Fall
Commercial Sturgeon Gillnet Fishery	Winter/Spring
	Fall
Commercial Shad Fishery	Summer
Commercial Yellow Perch Fishery	Winter/Spring
Hanford Reach Commercial/Subsistence Fishery	Winter/Spring
	Summer
	Fall
Tributary fisheries	Willamette
	Washington tributary smelt
	Wind River
	Spring Little White Salmon
	Fall Little White Salmon River
	Hood River
	White Salmon River
	Klickitat River
	Spring Deschutes
	Fall Deschutes River
	John Day River
	Umatilla River
	Walla Walla River
	Yakima River
	Icicle Creek
	Snake River basin

[1] The fisheries shown in **bold** are not expected to impact to ESA listed species.

2.0 STATUS OF SPECIES UNDER THE ENVIRONMENTAL BASELINE

In order to describe a species' status, it is first necessary to define precisely what "species" means in this context. Traditionally, one thinks of the ESA listing process as pertaining to entire taxonomic species of animals or plants. While this is generally true, the ESA also recognizes that there are times when the listing unit must necessarily be a subset of the species as a whole. In these instances, the ESA allows a "distinct population segment" (DPS) of a species to be listed as threatened or endangered. Snake River fall Chinook salmon are just such a DPS and, as such, are for all intents and purposes considered a "species" under the ESA.

NMFS developed the approach for defining salmonid DPSs in 1991 (Waples 1991). It states that a population or group of populations is considered distinct if they are "substantially reproductively isolated from conspecific populations," and if they are considered "an important component of the evolutionary legacy of the species." A distinct population or group of populations is referred to as an evolutionarily significant unit (ESU) of the species. Hence, Snake River fall Chinook salmon, for example, constitute an ESU of the species *Onchorhyncus tshawytscha*.

In its review of population status and the effects of the proposed actions on the listed salmonid ESUs in the Columbia River basin, NMFS is using developing science from several areas including the Viable Salmonid Populations (VSP) paper and Recovery Exploitation Rate (RER) analysis. Each of these are described briefly below to provide context prior to their application in the subsequent ESU-specific status discussions.

<u>Viable Salmonid Population</u>
One approach for assessing the status of an ESU and its component populations that is being developed by NMFS is described in a paper related to VSPs (McElhany et. al. 2000). This paper provides guidance for determining the conservation status of populations and ESUs that can be used in ESA-related processes. In this biological opinion, we rely on VSP guidance in describing the population or stock structure of each ESU and the related effects of the action.

A population is defined in the VSP paper as a group of fish of the same species spawning in a particular lake or stream (or portion thereof) at a particular season, which to a substantial degree do not interbreed with fish from any other group spawning in a different place or in the same place at a different season. Because populations as defined here are relatively isolated, it is biologically meaningful to evaluate the risk of extinction of one population independently from any other. Some ESUs may have only one population while others will have many.

The task of identifying populations within an ESU will require making judgments based on the available information. Information regarding the geography, ecology, and genetics of the ESU are relevant to this determination. This is a task that will generally be taken up as part of the recovery planning process. The Viable Salmonid Population (VSP) paper provides guidance regarding parameters that can be used for evaluating population status including abundance, productivity, spatial structure, and diversity. In this biological opinion we consider particularly the guidance related to abundance. The paper provides several rules of thumb that are intended to serve as guidelines for setting population specific thresholds (McElhany et al. 2000). The guidance relates to defining both "viable" populations levels and "critical" abundance levels. Although specific recommendations regarding threshold abundance levels for the effected ESUs are incomplete and, in some cases preliminary, the concepts are developed in the biological opinion to the degree possible for evaluating population status and the related effect of the action. NMFS has recently provided interim abundance targets for ESUs in the Interior Columbia Basin (Lohn 2002).

Recovery Exploitation Rate

In general and where possible, NMFS has sought to evaluate the proposed fisheries using biologically-based measures of the total exploitation rate that occurred across the full range of the species. Toward this end, NMFS has developed an approach for defining target exploitation rates that can be related directly to the regulatory definition of jeopardy. One product of this approach is a Rebuilding Exploitation Rate (RER) that can be calculated for representative stocks within ESUs. NMFS can then evaluate proposed fisheries, at least in part, by comparing the RERs to stock-specific exploitation rates that are anticipated as a result of the proposed fisheries including those outside the action area. This method has been developed and applied primarily with respect to Puget Sound Chinook stocks (NMFS 2000c). However, an RER has been developed and used in recent years for evaluating harvest related mortality for the Coweeman stock in the Lower Columbia River ESU. The RER approach was used as part of the assessment of the Pacific Salmon Treaty in 1999 (NMFS 1999a), the 2000 biological opinion on PFMC fisheries (NMFS 2000c) and more recently for applications of take limits for Puget Sound Chinook under the 4(d) Rule (NMFS 2003b). NMFS recently updated their RER analysis for the Coweeman stock which is part of the Lower Columbia River Chinook ESU, and has used the updated RER for evaluating ocean and inriver fisheries since 2002 (Lohn and McInnis 2004). Because of the comprehensive nature of the Coweeman RER standard and close relationship between ocean and inriver fisheries, the Parties proposed to use it for evaluating inriver fisheries as well.

NMFS recently completed a comprehensive status review for 27 West Coast salmon and steelhead ESUs previously listed as threatened or endangered species under the ESA (BRT 2003). There are 12 ESUs currently listed as threatened or endangered, and one proposed for listing under the ESA that may be affected by the proposed fisheries; all of them considered in the analysis of this opinion.

NMFS recently proposed revisions to Columbia Basin salmon and steelhead listing determinations based on the status review (69 FR 33102, June 14, 2004). Under the proposed listing rule, the listing status of Upper Columbia River steelhead would change from endangered to threatened. The listing status of other ESUs in the basin would remain unchanged. Lower Columbia river coho salmon are now proposed for listing as threatened under the ESA. The Federal Register notice also proposes that some of the hatchery-origin fish, that are clearly related to natural-origin fish, should be included as part of the listed ESUs. If the final determination (expected in 2005) reflects this proposal, then those hatchery fish determined to be part of the ESUs will be included as part of the revised ESU definitions.

The discussion to follow will be divided into two parts: Species Life History, Distribution, Trends, and Critical Habitat; and Factors Affecting the Environmental Baseline.

2.1 Life History, Critical Habitat, Distribution and Trends of Affected ESUs

All of the thirteen salmonid ESUs in the Columbia River listed or proposed for listing under the ESA are present in the action area and may be affected by the proposed fisheries (Table 1). Snake River fall Chinook, Snake River spring/summer Chinook, Lower Columbia River Chinook, and Upper Willamette River Chinook salmon, and Columbia River Chum salmon ESUs are listed as threatened. The Upper Columbia River Chinook and Snake River Sockeye salmon, and Upper Columbia River steelhead ESU are listed as endangered; and Snake River, Lower Columbia River, Middle Columbia River, and Upper Willamette steelhead ESUs are listed as threatened. The Lower Columbia River coho ESU is proposed for listing as threatened.

Critical habitat was previously designated for all of the affected listed ESUs. However, for all affected ESUs, except for the Snake River fall Chinook, Snake River spring/summer Chinook, and Snake River sockeye salmon ESUs, the critical habitat designations were vacated and remanded to NMFS for new rule making pursuant to a May 2002 court order. In absence of a new rule designating critical habitat for those ESUs, this consultation will evaluate the effects of the proposed actions on the essential features of species' habitat to determine whether those actions are likely to jeopardize the species' continued existence. Critical habitat for Lower Columbia River coho has not yet been proposed for designation.

2.1.1 Upper Columbia River Spring-Run Chinook Salmon

<u>Life history and critical habitat</u>

The Upper Columbia River Spring-Run Chinook Salmon ESU inhabits tributaries upstream from the Yakima River to Chief Joseph Dam. Upper Columbia River spring-run Chinook salmon have a stream-type life history. Adults return to the Wenatchee River from late March through early May, and to the Entiat and Methow Rivers from late March through June. Most adults return after spending 2 years in the ocean, although 20% to 40% return after 3 years at sea. Like Snake River spring/summer-run Chinook salmon, Upper Columbia River spring-run Chinook salmon experience very little ocean harvest because they are moved through the fishing area before fisheries begin. Peak spawning for all three populations occurs from August to September. Smolts typically spend 1 year in freshwater before migrating downstream. There are slight genetic differences between this ESU and others containing stream-type fish, but more importantly, the ESU boundary was defined using ecological differences in spawning and rearing habitat (Myers et al. 1998). The Grand Coulee Fish Maintenance Project (1939 through 1943) may have had a major influence on this ESU because fish from multiple populations were mixed into one relatively homogenous group and redistributed into streams throughout the upper Columbia region. Critical habitat for the Upper Columbia River Spring Chinook Salmon ESU was designated on February 16, 2000 (65 FR 7764), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

<u>Distribution and trends</u>

Grand Coulee Dam, completed in 1938, formed an impassable block to the upstream migration of anadromous fish. Chief Joseph Dam was constructed on the mainstem Columbia River downstream from Grand Coulee Dam and is also an anadromous block. There are no specific estimates of historical production of spring-run Chinook salmon from mainstem tributaries above Grand Coulee Dam. Habitat typical of that used by spring-run Chinook salmon in accessible portions of the Columbia River basin is found in the middle/upper reaches of mainstem tributaries above Grand Coulee Dam. It is possible that the historical range of this ESU included these areas; alternatively, fish from the upper reaches of the Columbia River may have been in a separate ESU.

An initial set of population definitions for the Upper Columbia River Spring-run Chinook Salmon ESU, along with basic criteria for evaluating the status of each population, were developed using the Viable Salmonid Population (VSP) guidelines described in McElhany et al. (2000). The definitions and criteria are described in Ford et al. (2001) and have been used in the development and review of Mid-Columbia River Public Utilities District (PUD) plans and the Federal Columbia River Power System(FCRPS) Biological Opinion. The interim definitions and criteria are being reviewed as recommendations by the Interior Columbia Technical Recovery Team. Briefly, the joint technical team recommended that the Wenatchee River, the Entiat River and the Methow River be considered as separate populations within the Upper Columbia River Spring-run Chinook Salmon ESU. The historical status of spring-run Chinook salmon production in the Okanogan River is uncertain. The committee deferred a decision on the Okanogan to the Technical Recovery Team. Abundance, productivity and spatial structure criteria for each of the populations in the ESU were developed and are described in Ford et al. (2001).

The number of natural-origin fish returning to the Wenatchee, Entiat, and Methow subbasins is shown in Table 4. NMFS proposed interim recovery abundance levels and cautionary levels (i.e., interim levels still under review and subject to change). Ford et al. (1999) characterize cautionary levels as abundance levels that the population fell below only about 10% of the time during a historical period when it was considered to be relatively healthy. Escapements for Upper Columbia River spring-run Chinook salmon were substantially below the cautionary levels during most of the 1990s, especially during 1995, 1996 and 1998, increasing risk to and uncertainty about the population's future status. From 1999-2004, there was an observed increase in abundance, especially in 2001 and 2002. Returns for 1999 to 2003, including the primary return year for the 1995, 1996 and 1998 broods, indicate a significant increase in the returns per spawner of four-year-old fish in the contributing broodyears. The most recent total 5-year average for total natural-origin fish returning to the ESU is 2,223 fish, compared to the previous 5 and ten-year averages of 295 and 1,180 fish, respectively. However, the corresponding returns to each subbasin (accounting for expected harvest, inter-dam loss, and prespawning mortality) were still at or substantially below the cautionary level for the Wenatchee River (except in 2001) and the Methow River (except in 2001 and 2002) populations (Table 4). The natural-origin fish returns to the Entiat River population have exceeded the cautionary levels for the last 5 years. The predicted return of natural-origin Upper Columbia River spring Chinook for 2005 is 6,200 adults at the mouth of the Columbia River. Given the predicted return, the expected return-to-subbasin for the populations, accounting for expected harvest, inter-dam loss, and prespawning mortality, would be about equivalent to the identified Cautionary Levels.

Short-term trends for the aggregate population areas reported in the 1998 Status Review (Myers et a1. 1998) ranged from -15.3% (Methow R.) to a -37.4% (Wenatchee R.). The escapements from 1996-1999 reflected that downward trend. According to the BRT report (BRT 2003), escapements increased substantially in 2000 and 2001 in all three systems. Returns to the Methow River and the Wenatchee River reflected the higher return rate on natural production as well as a large increase in contributions from supplementation programs. The BRT did not have data available for 2002-2004, which have been higher than returns for most of the 1990s and prior to 2000. Short-term trends (1990-2001) in natural returns remain negative for all three upper Columbia River spring-run Chinook salmon populations. Natural returns to the spawning grounds for the Entiat, Methow, and Wenatchee River populations continued downward at average rates of 3%, 10%, and 16% respectively. It is not clear how this analysis would change by including escapement date for 2002-04.

Six hatchery populations are included in the listed ESU; all six are considered essential for recovery, and therefore listed. Recent artificial production programs for fishery enhancement and hydrosystem mitigation have been a concern because a non-native (Carson Hatchery) stock was used. However, programs have been initiated to develop locally adapted brood stocks to supplement natural populations. Facilities where problems with straying and interactions with natural stock are known to occur are phasing out use of Carson stock. Captive broodstock conservation programs are under way in Nason Creek and White River (the Wenatchee basin) and in the Twisp River (Methow basin) to prevent the extinction of those spawning populations. All spring Chinook salmon passing Wells Dam in 1996 and 1998 were trapped and brought into the hatchery to begin a composite-stock broodstock supplementation program for the Methow basin.

Table 4. Estimates of the number of natural-origin fish returning to the sub-basin for each of the identified Upper Columbia River spring Chinook populations and preliminary estimates for the Recovery Abundance and

Year	Wenatchee River	Entiat River	Methow River
1979	1,154	241	554
1980	1,752	337	443
1981	1,740	302	408
1982	1,984	343	453
1983	3,610	296	747
1984	2,550	205	890
1985	4,939	297	1,035
1986	2,908	256	778
1987	2,003	120	1,497
1988	1,832	156	1,455
1989	1,503	54	1,217
1990	1,043	223	1,194
1991	604	62	586

Table 4. Estimates of the number of natural-origin fish returning to the sub-basin for each of the identified Upper Columbia River spring Chinook populations and preliminary estimates for the Recovery Abundance and

Year	Wenatchee River	Entiat River	Methow River
1992	1,206	88	1,719
1993	1,127	265	1,496
1994	308	74	331
1995	50	6	33
1996	122	28	0
1997	264	69	271
1998	164	52	0
1999	173	64	180
2000	489	175	226
2001	2,100	364	2474
2002	1,033	226	1550
2003	847	194	53
2004	944	302	190
Recovery Abundance	**3,750**	**500**	**2,000**
Cautionary Abundance	**1,200**	**150**	**750**

2.1.2 Snake River Fall Chinook Salmon

Life history and critical habitat

Adult fall Chinook begin entering the Columbia River in July and August. The Snake River component of the fall Chinook run migrates past the Lower Snake river mainstem dams in September and October. Spawning occurs from October through November. Juveniles emerge from the gravels in March and April of the following year. Snake River fall Chinook are subyearling migrants, moving downstream from natal spawning and early rearing areas from June through early fall. The ocean distribution of Snake River fall Chinook extends from the Gulf of Alaska to central California, although the center of their ocean distribution is located to the north off of Vancouver Island.

Fall Chinook returns to the Snake River generally declined through the first half of this century (Irving and Bjornn 1981). In spite of the declines, the Snake River basin remained the largest single natural production area for fall Chinook in the Columbia drainage into the early 1960s (Fulton 1968). Spawning and rearing habitat for Snake River fall Chinook was reduced by approximately 80% by the construction of a series of dams on the mainstem Snake River. Historically, the primary spawning fall Chinook spawning areas were located on the upper mainstem Snake River. Currently, natural spawning is limited to the area from the upper end of Lower Granite Reservoir to Hells Canyon dam and the lower reaches of the Imnaha, Grande Ronde, Clearwater and Tucannon rivers.

Because of the lack of data describing the distribution of fall Chinook before development of the hydrosystem, it is not possible to define the historical population structure. However, fish in the ESU currently tend to aggregate in areas of suitable habitat, with scattered spawning between aggregates. It is likely that a similar population structure extended upstream. The ESU likely historically consisted of a single independent population with discontinuous aggregates functioning as elements of a metapopulation. Regardless of what the historical structure was, Snake River fall Chinook are now considered to consist of a single naturally spawning population.

Lyons Ferry Hatchery was established as one of the hatchery programs under the Lower Snake Compensation Plan administered through the USFWS. Snake River fall Chinook production is a major program for Lyons Ferry Hatchery, which is operated by the Washington Department of Fish and Wildlife and is located along the Snake mainstem between Little Goose Dam and Lower Monumental Dam. WDFW began developing a Snake River fall Chinook broodstock in the early 1970s through a trapping program at Ice Harbor Dam and Lower Granite Dam. The Lyons Ferry facility became operational in the mid-1980s and took over incubation and rearing for the Snake River egg bank program.

The Snake River fall Chinook ESU include all natural-origin fall Chinook in the mainstem Snake River and several tributaries including the Tucannon, Grande Ronde, Salmon, and Clearwater rivers. Four artificial propagation programs are also considered to be part of the ESU including the Lyons Ferry Hatchery, Fall Chinook Acclimation Ponds Program, Nez Perce Tribal Hatchery, and Oxbow Hatchery fall Chinook programs. Critical habitat for the Snake River fall Chinook salmon ESU was designated on December 28, 1993 (58 FR 68543).

<u>Distribution and trends</u>
No reliable estimates of historical abundance for Snake river fall-run Chinook are available, but because of their dependence on mainstem habitat for spawning, fall Chinook have probably been impacted to a greater extent by the development of irrigation and hydroelectric projects than any other species of salmon on the Columbia River. It has been estimated that the mean number of adult Snake River fall Chinook salmon declined from 72,000 in the 1930s and 1940s to 29,000 during the 1950s. In spite of this, the Snake River remained the most important natural production area for fall Chinook in the entire Columbia River basin through the 1950s. The number of adults counted at the uppermost Snake River mainstem dams averaged 12,720 total spawners from 1964 to 1968, 3,416 spawners from 1969 to 1974, and 610 spawners from 1975 to 1980 (Waples, et al. 1991). The escapement of adult, natural-origin fish continued to decline through the 1980s reaching a low of 78 individuals in 1990 (Table 3) just prior to their listing under the ESA in 1992.

The abundance of Snake River fall Chinook increased gradually after 1990 and more significantly in recent years. The recent increase in abundance is due in part to returns from the hatchery supplementation program and in part to higher survival rates. During each of the last four years more than 12,000 adult Snake River fall Chinook returned to Lower Granite Dam. Some of these were marked hatchery fish that were removed for use as brood stock. Total escapement past Lower Granite Dam averaged nearly 11,000 from 2001 - 2003, and over 15,000 in 2004. The escapement of natural-origin fish past Lower Granite Dam averaged number over 2,500 for the last five years, and over 3,700 for the last three years (Table 3). The 2003 natural-origin escapement over Lower Granite Dam for 2003 was 3,895, which is the second largest escapement on since 1975, when data began to be collected. The highest escapement was observed in 2001. The 2004 run reconstruction for Snake River fall Chinook was not available for this consultation.

These natural-origin returns can be compared to the previously identified lower abundance threshold of 300 and the interim recovery escapement goal of 2,500. These are the kinds of benchmarks suggested in the Viable Salmonid Populations paper (McElhany et al. 2000), which NMFS relies on for guidance for evaluating population status. The lower threshold is considered indicative of increased relative risk to a population in the sense that the further and longer a population is below the threshold, the greater the risk; it was clearly not characterized as a "redline" below which a population must not go (BRWG 1994). The interim recovery goal of at least 2,500 naturally produced spawners (to be calculated as an eight year geometric mean) in the lower Snake River and its tributaries was initially identified in the 1995 Proposed Recovery Plan for Snake River Salmon (NMFS 1995a). NMFS subsequently reiterated its recommendation of the 2,500 fish as an interim abundance target for Snake River fall Chinook (Lohn 2002). The Interior Columbia Basin Technical Recovery Team (TRT) is currently developing delisting criteria for Snake River fall Chinook and other listed species, but their recommendations are not yet available.

Table 5. Escapement and Stock Composition of Adult Fall Chinook at Lower Granite Dam

				Stock Comp. of Lower Granite Escapement		
					Hatchery Origin	
Year	Lower Granite Count	Marked Fish to Lyons Ferry Hatch.	Lower Granite Dam Escapement	Natural Origin	Snake R.	Non-Snake R.
1975	1,000		1,000	1,000		
1976	470		470	470		
1977	600		600	600		
1978	640		640	640		
1979	500		500	500		
1980	450		450	450		
1981	340		340	340		
1982	720		720	720		
1983	540		540	428	112	
1984	640		640	324	310	6
1985	691		691	438	241	12
1986	784		784	449	325	10
1987	951		951	253	644	54
1988	627		627	368	201	58
1989	706		706	295	206	205
1990	385	50	335	78	174	83
1991	630	40	590	318	202	70
1992	855	187	668	549	100	19
1993	1170	218	952	742	43	167
1994	791	185	606	406	20	180
1995	1,067	430	637	350	1	286
1996	1,308	389	919	639	74	206
1997	1,451	444	1,007	797	190	20
1998	1,909	947	962	306	479	177
1999	3,381	1,519	1,862	905	882	75
2000	4,036	1,372	2,664	1,148	1,393	123
2001	12,793	2,918	9,875	5,163	5,070	274
2002	12,297	2,406	9,891	2,116	7,831	168
2003	12,158	458	11,700	3,895	8,565	1,083
2004	15,582		15,582			

Interim Recovery Escapement Goal	**2,500**
Abundance Threshold	**300**

As stated previously, increases in the escapement of Snake River fall Chinook are due in part to returns from the Lyons Ferry Hatchery release and supplementation program. The Lyons Ferry Hatchery stock is part of the Snake River fall Chinook ESU. The Lyons Ferry program was initiated with on-station releases from the 1983 brood year. The Lyons Ferry supplementation program involves outplanting of yearlings and sub-yearlings above Lower Granite Dam, most often from acclimation sites. The supplementation program was initiated with releases from the 1994 brood year, but has been scaled up in recent years to include approximately 450,000 yearling and 2,000,000 or more sub-yearling releases. Further increases in the sub-yearling component of the program, consistent with the life history of the natural-origin component of the ESU, are anticipated.

The general increase in abundance is also apparent from other indicators. The number of redds observed in the Snake River and associated tributaries reflects the significant increase in escapement seen in recent years (Figure 1). Higher escapements have resulted in an increase in the number of sub-yearling outmigrants arriving at Lower Granite Dam (Figure 2). Jack counts at Lower Granite Dam also provide an early indicator of future returns and they have been at high levels in recent years (Figure 3). The jack counts in 2000 and 2002 correspond to the two highest adult returns since data has been collected at Lower Granite Dam in 2001 and 2003, respectively. Jack counts at Lower Granite Dam in 2004 suggest that the returns in 2005 will be generally comparable to those observed in the last three years.

Figure 1. Fall Chinook Redds in Snake River and tributaries between Lower Granite and Hells Canyon Dams

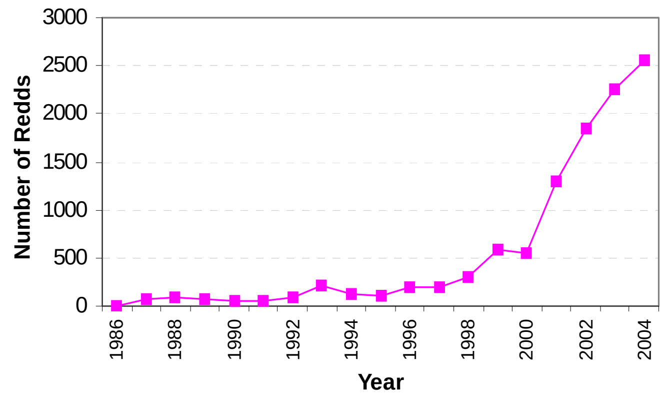
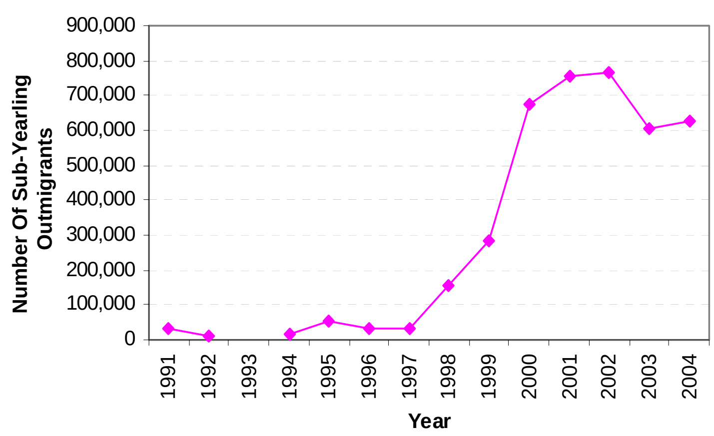


Figure 2. Estimated number of natural-origin sub-yearlings outmigrants at Lower Granite Dam



Although the observed increase in abundance is due in part to higher returns from the supplementation program, higher escapements of hatchery and natural-origin fish are also due to improvements in ocean survival. The Pacific Salmon Commission's Chinook Technical Committee calculates a survival index that measures the annual variability in natural mortality before the second year of ocean residence referred to as an environmental variant (EV) scalar (PSC 2003). The survival index for the Lyons Ferry Hatchery stock has been generally increasing and is up substantially in recent years (Figure 4). Increased returns can therefore be attributed to both increases in the supplementation program and improved survival conditions.

Figure 3 . Fall Chinook Jack Counts at Lower GraniteDam

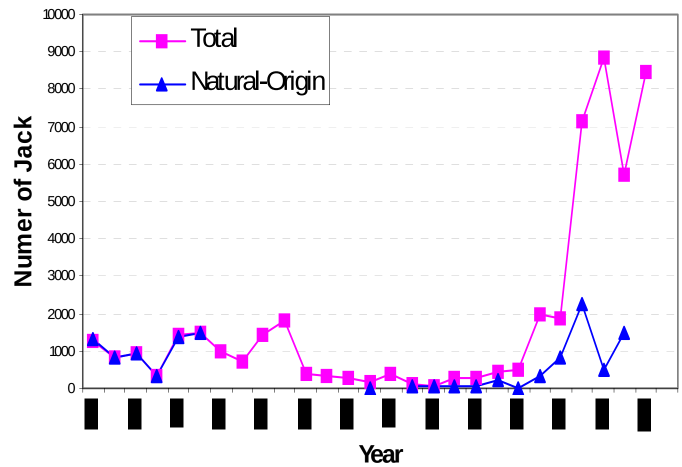
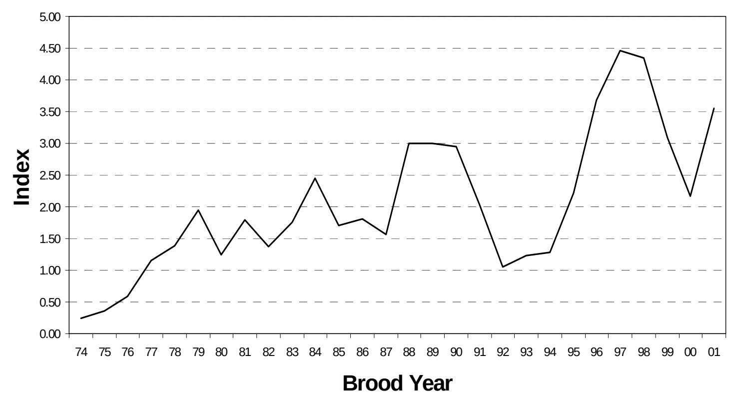


Figure 4. Early life history survival index for Lyons Ferry Hatchery fall Chinook.

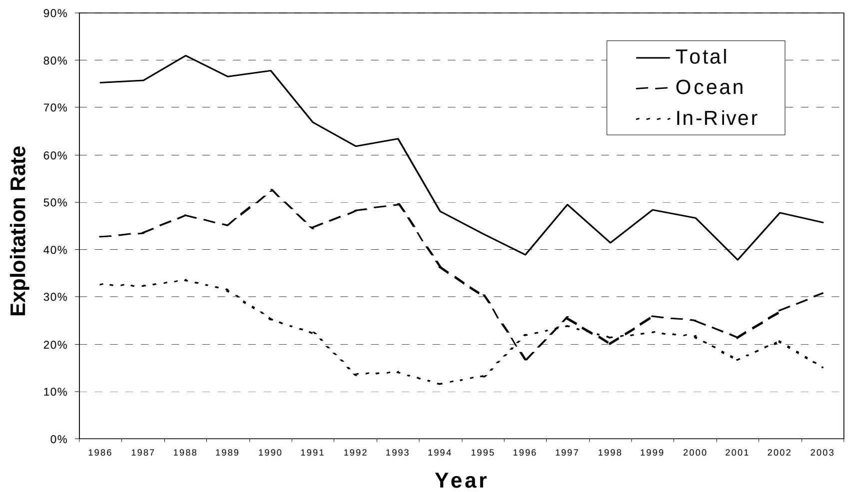


The Biological Review Team (BRT) reported on productivity trends based on an analysis of data available through 2001 (July 31, 2003 BRT Report). The BRT concluded that both the long-term and short-term trends in natural returns are positive (1.05, 1.22). The short-term (1990-2001) estimates of the median population growth rate λ are 0.98 assuming a hatchery spawning effectiveness of 1.0 (equivalent to that of wild spawners) and 1.137 with a hatchery spawning effectiveness of 0. The estimated long-term growth rate for the Snake River fall Chinook population is strongly influenced by the hatchery effectiveness assumption. If hatchery spawners have been equally as effective as natural-origin spawners in contributing to brood year returns, the long-term λ estimate is 0.899 and the associated probability that λ is less than 1.0 is estimated as 98.7%. If hatchery returns over Lower Granite Dam are not contributing at all to natural production, the long-term estimate of λ is 1.024. The associated probability that λ is greater than 1.0 is 0.26, under the assumption that hatchery effectiveness is 0.

Broodyear return-per-spawner (r/s) estimates were low for three or more consecutive years in the mid-1980s and the early 1990s. The large increase in natural abundance in 2000 and 2001 is reflected by increases in the 1996 and 1997 return-per-spawner estimates (1997 r/s based on 4-year-old component only). The BRT analysis did not include the now available data for 2002 - 2004.

In considering the proposed 2005-2007 fisheries, it is also pertinent to review the magnitude of harvest reductions. The average harvest rate of Snake River fall Chinook in the Columbia River from 1994 to 2004 was 25% (Figure 5), lower than the 31.29% harvest rate ceiling that has been in place since that time. Taken from a broader perspective we can look at the combined impact of ocean and inriver fisheries and how that has changed over the last 20 years. The exploitation rate on Snake River fall Chinook in the ocean and inriver fisheries combined has declined from an average of 66%, from 1986-1995, to an average of 45%, from 1995 to 2003 representing a 32.5% reduction in the overall exploitation rate.

Figure 5. Ocean and in-river exploitation rates for Snake River fall Chinook.



The existence of the Lyons Ferry program is also a consideration in evaluating the status of the ESU since it reduces the short-term risk of extinction by providing a reserve of fish from the ESU. The return of fish from the supplementation program is not a substitute for the return of self-sustaining natural populations. However, supplementation can generally be used to mitigate the short-term risk of extinction by boosting the initial abundance of spawners while other actions are taken to increase the productivity of the system to the point where the population is self-sustaining and supplementation is no longer required. Aggressive supplementation was adopted as part of an interim recovery strategy for Snake River fall Chinook because of the circumstances particular to this ESU. As described above, much of the historic habitat for Snake River fall Chinook was eliminated with spawning now limited to what were historically marginal areas. Because Snake River fall Chinook are mainstem spawners, the opportunity for habitat improvements is relatively limited. Survival rates have increased partly because of actions taken to improve passage conditions through the migration corridor. Supplementation was adopted as part of the mix of strategies to increase abundance, promote species survival, and provide the opportunity for eventual recovery as defined under the ESA.

The Lyons Ferry hatchery programs have contributed to the recent substantial increases in total ESU abundance, including both natural-origin and hatchery-origin ESU components. Spawning escapement has increased to several thousand adults (from a few hundred in the early 1990's) due in large part to increased releases from these hatchery programs. These programs collectively have had a beneficial effect on ESU abundance in recent years. The BRT noted, however, that the large but uncertain fraction of naturally spawning hatchery fish complicates assessments of ESU productivity. Therefore, the contribution of ESU hatchery programs to the productivity of the ESU in-total is uncertain. As ESU abundance has increased in recent years, ESU spatial distribution has increased. The Snake River fall-run Chinook hatchery programs contributed to this reduction in risk to ESU spatial distribution. The Lyons Ferry stock has preserved genetic diversity during critically low years of abundance. However, the ESU-wide use of a single hatchery broodstock may pose long-term genetic risks, and may limit adaptation to different habitat areas. Although the ESU likely historically consisted of a single independent population, it was most likely composed of diverse production centers. Additionally, the broodstock collection practices employed pose risks to ESU spatial structure and diversity. Release strategies practiced by the ESU hatchery programs (e.g., extended captivity for about 15 percent of the fish before release) is in conflict with the Snake River fall-run Chinook life history, and may compromise ESU diversity. Collectively, artificial propagation programs in the ESU provide slight benefits to ESU abundance, spatial structure, and diversity, but have neutral or uncertain effects on ESU productivity (69 FR 33102, June 14, 2004).

2.1.3 Snake River Spring/Summer Chinook Salmon

Life history and critical habitat

The Snake River Spring/Summer Chinook Salmon Evolutionarily Significant Unit (ESU) includes those fish that spawn in the Snake River drainage and its major tributaries, including the Grande Ronde River and the Salmon River, and that complete their adult, upstream migration (passing Bonneville Dam) between March and July. These stream-type fish rear in freshwater for slightly more than a year before smoltification and seaward migration. Since the late 1800s, the ESU has suffered dramatic declines as a result of heavy harvest pressures, habitat modification and loss, and likely inadvertent negative effects of hatchery practices. More recent declines, since the 1950s, have occurred with the construction of the hydropower system on the Snake and Columbia Rivers. As a result of these declines in abundance, this ESU was listed as threatened under the Endangered Species Act in 1992.

Many of the Snake River tributaries used by spring and summer Chinook salmon runs exhibit two major features: extensive meanders through high elevation meadowlands and relatively steep lower sections joining the drainages to the mainsteam Salmon River (Mathews and Waples 1991). The combination of relatively high summer temperatures and the upland meadow habitat creates the potential for high juvenile salmonid productivity. Historically, the Salmon River system may have supported more than 40% of the total return of spring-run and summer-run Chinook Salmon to the Columbia River system (e.g., Fulton 1968)

Current runs returning to the Clearwater River drainages were not included in the Snake River Spring/Summer-run Chinook salmon ESU. Lewiston Dam in the lower mainsteam of the Clearwater River was constructed in 1927 and functioned as an anadromous block until the early 1940s (Mathews and Waples 1991). Spring and summer Chinook salmon runs into the Clearwater system were reintroduced via hatchery outplants beginning in the late 1940s. As a result, Mathews and Waples (1991) concluded that even if a few native salmon survived the hydropower dams, "... the massive outplantings of non-indigenous stocks presumably substantially altered, if not eliminated, the original gene pool."

Sping-run and summer-run Chinook salmon from the Snake River Basin exhibit stream type life-history characteristics (Healey 1983). Eggs are deposited in Late summer and early fall, incubate over the following winter and hatch in late winter/early spring of the following year. Juveniles rear through the summer, overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer rearing and/or overwintering areas. Snake River sprong/summer-run Chinook salmon return from the ocean to spawn primarily as 4 and 5 year old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old 'jacks', heavily predominated by males.

Because of their timing and ocean distribution, Snake River spring/summer Chinook salmon stocks are subject to very little ocean harvest. For detailed information on the life history and stock status of Snake River spring/summer Chinook salmon, see Matthews and Waples (1991), NMFS (1991), and 56 FR 29542 (June 27, 1991). Critical habitat was designated for SR spring/summer chinook salmon on December 28, 1993 (58 FR 68543) and was revised on October 25, 1999 (64 FR 57399).

Distribution and trends

Direct estimates of annual runs of historical spring/summer-run Chinook salmon to the Snake River are not available. Chapman (1986) estimated the Columbia River produced 2.5 million to 3.0 million spring-run and summer-run Chinook adult salmon per year in the late 1800s. Total spring-run and summer-run Chinook salmon production from the Snake River basin contributed a substantial proportion of those runs. Bevan et al. (1994) estimated the number of wild adult Snake River spring/summer Chinook salmon in the late 1800s to be more than 1.5 million fish annually. By the 1950s, the population had declined to an estimated 125,000 adults, and by the 1960s, returns to the Snake River had dropped to roughly 100,000 adults per year (Fulton 1968). Escapement estimates indicate that the population continued to decline through the 1970s. Increasing hatchery production contributes to subsequent years' returns, masking a continued decline in natural production.

Returns varied through the 1980s, but have declined further in recent years (Table 3). Record low returns were observed in 1994 and 1995. Dam counts were modestly higher from 1996 through 1998, but declined in 1999. The last four years (2001-2004), the aggregate escapement of Snake River spring/summer-run Chinook over Lower Granite Dam have been all record years since 1979. 2001 is he highest year on record, with 45,281 natural-origin fish over the dam, followed by 2003 (32,366 fish), 2002 (30,248 fish), and 2004 (21,401 fish).

Based on genetic and geographic considerations, the Interior Columbia Basin Technical Recovery Team established five major groupings in this ESU: The Lower Snake River Tributaries, the Grande Ronde and Imnaha Rivers, the South Fork Salmon River, the Middle Fork Salmon River, and the Upper Salmon River. In addition, two unallied areas were identified: the Little Salmon River and Chamberlain Creek. The Interior Columbia Basin Technical Recovery Team further subdivided these groupings into a total of 31 extant demographically independent populations (BRT 2003).

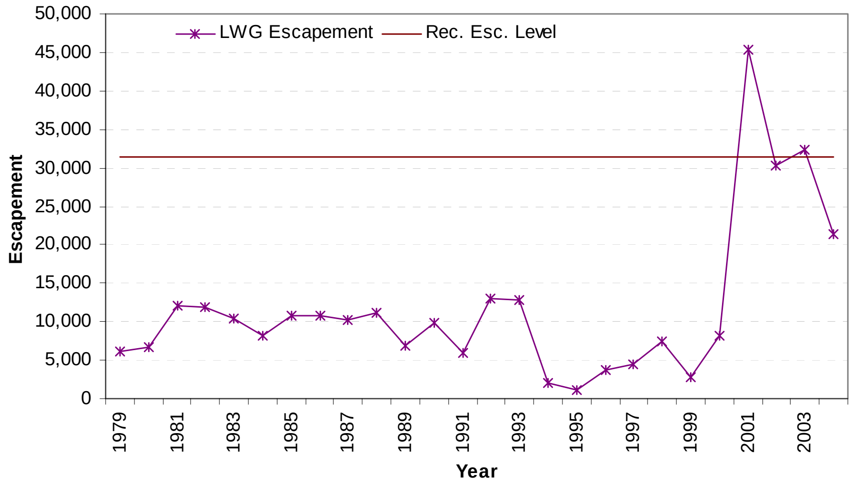
For management purposes, the spring and summer Chinook salmon in the Columbia River basin, including those returning to the Snake River, had been managed as separate stocks. Historical databases, therefore, provide separate estimates for the spring and summer Chinook salmon components. New information has recently became available related to the timing of the Snake River and the Upriver summer Chinook that have lead to changes in the past assumptions and management practices. TAC analyzed the run timing of upriver spring and Snake River spring/summer Chinook salmon using PIT tag data. TAC learned that the timing of Snake River summer Chinook is earlier and better grouped with the spring runs, and that almost all Snake River summer Chinook have passed Bonneville by June 15. By adjusting the spring/summer separation date to June 15 to better reflect the run-timing of listed summer populations of the Snake River spring/summer-run Chinook ESU, there is additional fishing opportunity on unlisted upriver summer Chinook.

Figure 6 shows the estimated annual escapement of adult, natural-origin Snake River spring/summer Chinook salmon over Lower Granite Dam since 1979. NMFS established an escapement goal of 31,440 natural spawners at Lower Granite Dam (measured as an eight year geometric mean) as one of its interim recovery goals for Snake River spring/summer Chinook (NMFS 1995a). The goal represents 60% of the 1962-1967 observed escapement at Ice Harbor Dam. Ice Harbor was the first dam built on the lower Snake River. The escapement at that time is believed to reflect a status that was generally healthy prior to the subsequent period of decline associated with further dam construction and other generally deteriorating conditions. The average escapement for the last 8 years is 19,026.

Table 6. Estimates of natural-origin Snake River spring/summer Chinook salmon counted at Lower Granite.

Year	Spring Chinook	Summer Chinook	Total	LWG Escapement
1979	2,573	2,714	5,287	6,181
1980	3,478	2,404	5,882	6,646
1981	7,941	2,739	10,680	12,127
1982	7,117	3,531	10,648	11,812
1983	6,181	3,219	9,400	10,417
1984	3,199	4,229	7,428	8,266
1985	5,245	2,696	7,941	10,773
1986	6,895	2,684	9,579	10,739
1987	7,883	1,855	9,738	10,198
1988	8,581	1,807	10,388	11,217
1989	3,029	2,299	5,328	6,788
1990	3,216	3,342	6,558	9,836
1991	2,206	2,967	5,173	6,013
1992	11,134	441	11,575	13,079
1993	5,871	4,082	9,953	12,831
1994	1,416	183	1,599	1,954
1995	745	343	1,088	1,186
1996	1,358	1,916	3,274	3,788
1997	2,126	5,137	7,263	4,409
1998	5,089	2,913	8,002	7,391
1999	1,335	1,584	2,919	2,856
2000	8,049	846	8,895	8,255
2001				45,281
2002				30,248
2003				32,366
2004				21,401

Figure 7. Escapement of adult natural-origin Snake River spring/summer Chinook salmon over Lower Granite Dam since 1979.



The Snake River spring/summer-run Chinook salmon ESU consists of 39 local spawning populations (subpopulations) spread over a large geographic area (Lichatowich et al. 1993). The number of fish returning to Lower Granite Dam is, therefore, divided among these subpopulations. The relationships between these subpopulations, and particularly the degree to which individuals may intermix, are unknown. It is unlikely that all 39 are independent populations per the definition in McElhany et al. (2000), which requires that each be isolated such that the exchange of individuals between populations does not substantially affect population dynamics or extinction risk over a 100-year time frame. Nonetheless, monitoring the status of subpopulations provides more detailed information on the status of the species than would an aggregate measure of abundance.

The BRT reports returns for a number of production areas (BRT 2003, figures A.2.2.1-A.2.2.16, Table A.2.2.1). In most cases data presented in the BRT report includes up to 2001, but in some cases up to 2002. The lowest five-year geometric mean returns for all of the individual Snake River spring/summer-run Chinook salmon production areas were in the 1990s. Sulphur Creek and Poverty Flats production areas had low five-year geometric mean in the early 1980s. Many, but not all, production areas had a large increase in returns in 2001, the year of higher generalized returns.

The BRT reported short-term and long-term λ estimates below 1 from all natural production data sets, reflecting the large declines since the 1960s (BRT 2003). Short-term trends and λ estimates were generally positive, with relatively large confidence intervals. Grande Ronde and Imnaha data sets had the highest short-term growth rate estimates. Tucannon River, Poverty Flats (not including 2000 and 2001), and Sulphur Creek index areas had the lowest short term λ estimates in the series. Patterns in returns per spawner for stocks with complete age information (e.g., Minam River) show a series of extremely low return rates in the early 1990s, followed by increases in the 1995-97 brood years (BRT 2003).

The BRT did not have data for 2002-2004 available. It is important to note that the average aggregate spring/summer-run natural-origin spawner returns for the last four years is almost five times the aggregate average for the previous 10 years. Including data sets for the 2002 to 2004 in the BRT analysis would almost surely help improve the short-term trend for most populations. Also, the average aggregate count for upriver spring and upriver summer Chinook salmon at Bonneville Dam between 2000-2004 was 329,112. Although only a small portion of this average number of fish were natural-origin spring/summer Chinook salmon destined for the Snake River for the same period (40,954), the average number of natural-origin Snake River spring/summer Chinook salmon between 2000 and 2004 was substantially higher than the contributing brood year escapements (comparable the average return to the Columbia River mouth between 1995 and 1999 was 7,150).

Seven of these subpopulations have been used as index stocks to analyze extinction risk and alternative actions that may be taken to meet survival and recovery requirements. The Snake River Salmon Recovery Team selected these subpopulations primarily because of the availability of a relatively long-term series of abundance data. The BRWG developed recovery and threshold abundance levels for the index stocks, which serve as reference points for comparisons with observed escapements (Table 7). The threshold abundances represent levels at which uncertainties (and, thus, the likelihood of error) about processes or population enumeration are likely to be biologically significant and at which qualitative changes in processes are likely to occur. They were not developed as indicators of pseudo-extinction or as absolute indicators of critical thresholds. In any case, escapement estimates for the index stocks have generally been well above threshold levels in recent years (Table 7).

2.1.4 Lower Columbia River Chinook Salmon

Life history and critical habitat

The Lower Columbia River Chinook ESU includes spring stocks, and fall tule[1] and bright[2] components. The abundance of fall Chinook greatly exceeds that of the spring component in the Lower Columbia River Chinook ESU. Spring-run Chinook salmon on the lower Columbia River, like those from coastal stocks, enter freshwater in March and April, well in advance of spawning in August and September. Historically, the spring migration was synchronized with periods of high rainfall or snowmelt to provide access to upper reaches of most tributaries, where spring stocks would hold until spawning (Fulton 1968, Olsen et al. 1992, WDF et al. 1993). The

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[1] "Tules" spawn within a few weeks of river return. They are distinguished by their dark skin coloration and advanced state of maturation at the time of freshwater entry (WDF et al. 1993) and exhibit distinct secondary maturation characteristics (including resorbed scales and pronounced kype). Most tule populations return to production areas lower in the Columbia River drainage.

[2] "Brights" are less mature at freshwater entry than tules, with a longer time interval between freshwater entry and spawning (Marshall et al. 1995). Brights return to areas throughout the basin, but are generally later returning and are primarily destined for areas higher in the drainage. Differences between tules and brights are consistent with genetic analysis (Myers et al. 1998).

remaining spring stocks in the ESU are found in the Sandy River on the Oregon side, and Lewis, Cowlitz, and Kalama Rivers on the Washington side.

Table 7. Adult natural-origin spawners for Snake River spring/summer Chinook index stocks, recovery levels identified by NMFS (1995a), and interim critical escapement thresholds suggested by BRWG (1994)*.

Brood year	Bear Valley	Marsh	Sulphur	Minam	Imnaha	Poverty Flats	Johnson
1979	209	83	90	30	234	84	73
1980	40	16	11	34	180	179	58
1981	151	115	43	47	445	193	106
1982	84	71	17	74	579	167	85
1983	165	59	45	76	427	338	154
1984	144	107	0	83	516	230	39
1985	295	196	62	404	623	358	184
1986	225	178	388	110	449	237	129
1987	455	271	68	161	401	546	177
1988	1,114	395	606	191	504	765	320
1989	91	80	43	115	134	236	99
1990	188	103	172	84	87	520	135
1991	180	71	213	80	71	488	146
1992	177	114	21	6	73	524	176
1993	709	218	264	123	357	786	344
1994	32	9	0	9	52	189	48
1995	16	0	4	37	55	74	20
1996	56	18	23	182	143	147	49
1997	218	107	42	123	153	228	231
1998	376	164	141	112	90	352	121
1999	75	0	0	94	75	138	47
2000	313	65	13	194	106	200	39
2001	709	344	95	305	287	753[1]	353
2002	1,120	334	169	440	371	636[1]	282
2003	1,264	605	178			749[1]	576
2004							
Recovery Levels	**900**	**450**	**300**	**450**	**850**	**850**	**300**
BRWG Threshold	**300**	**150**	**150**	**150**	**300**	**300**	**150**

*Bear Valley, Marsh, Sulphur and Minam are spring Chinook index stocks. Poverty Flats and Johnson are summer run index Chinook stocks. Imnaha has an intermediate run timing.
[1] Adult spawner estimates are preliminary for South Fork Salmon River (Poverty Flat), 2001-03 (need jack prop.)

Fall Chinook predominate the Lower Columbia River salmon ESU. Fall Chinook return to the river in mid-August and spawn within a few weeks (WDF and WDW 1993, Kostow 1995). The majority of fall-run Chinook salmon emigrate to the marine environment as subyearlings (Reimers and Loeffel 1967, Howell et al. 1985, WDF and WDW 1993). A portion of returning adults whose scales indicate a yearling smolt migration may be the result of extended hatchery-rearing programs rather than of natural, volitional yearling emigration. It is also possible that modifications in the river environment may have altered the duration of freshwater residence. Adults return to tributaries in the Lower Columbia River at 3 and 4 years of age for fall-run fish and 4 to 5 years of age for spring-run fish. This may be related to the predominance of yearling smolts among spring-run stocks. Marine coded-wire-tag recoveries for Lower Columbia River stocks tend to occur off the British Columbia and Washington coasts, though a small proportion of the tags are recovered as far north as Alaska.

As part of its effort to develop viability criteria for Lower Columbia River Chinook, the Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) has identified historically demographically independent populations (Myers et al. 2002). Population boundaries are based on an application of Viable Salmonid Populations definition (McElhany et al. 2000). Myers et al. hypothesized that the ESU historically consisted of 20 fall-run populations (“tules”), two late fall-run populations (“brights”) and nine spring-run populations for a total of 31 populations (Myers et al. 2002). The WLC-TRT stratified Lower Columbia River Chinook populations based on life-history characteristics and ecological zones (McElhany et al. 2002). The WLC-TRT suggests that a viable ESU would need a number of viable populations in each of these strata.

Several of the hatchery populations in the Lower Columbia River are included in the ESU but were not listed. Under the proposed listing, 17 hatchery-origin populations would be included as part of the listed ESU. Critical habitat for the Lower Columbia River Chinook ESU was designated on February 16, 2000 (65 FR 7764), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

<u>Distribution and trends</u>

All basins in the region are affected to varying degrees by habitat degradation. Major habitat problems are related primarily to blockages, forest practices, urbanization in the Portland and Vancouver areas, and agriculture in flood plains and low-gradient tributaries. Substantial Chinook salmon spawning habitat has been blocked (or passage substantially impaired) in the Cowlitz (Mayfield Dam 1963, RKm 84), Lewis (Merwin Dam 1931, RKm 31), Clackamas (North Fork Dam 1958, RKm 50), Hood (Powerdale Dam 1929, RKm 7), and Sandy (Marmot Dam 1912, RKm 48; Bull Run River dams in the early 1900s) rivers (WDF and WDW 1993, Kostow 1995).

There are no reliable estimates of historic abundance for this ESU, but it is generally agreed that there have been vast reductions in natural production over the last century. Recent abundance of spawners includes a 5-year average of 62,300 natural spawners (2000-2004) with an additional escapement of 38,400 fish to the hatcheries (PFMC 2005). About two-thirds of the natural spawners were presumably first-generation hatchery strays.

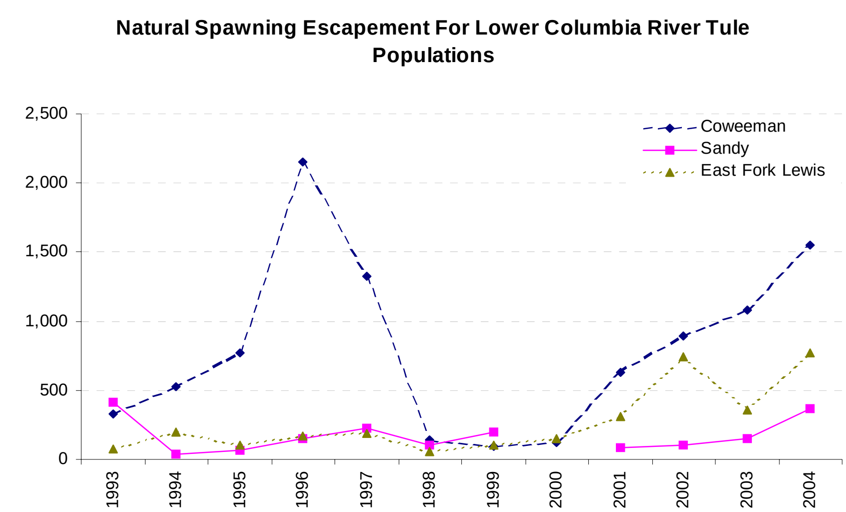
The remaining spring-run Chinook salmon stocks in the Lower Columbia River Chinook salmon ESU are found in the Sandy River, Oregon, and the Lewis, Cowlitz, and Kalama rivers, Washington. There are three self-sustaining natural populations of tule Chinook in the Lower Columbia River (Coweeman, East Fork Lewis, and Sandy) that are not substantially influenced by hatchery strays. These are all relatively small stocks (see Figure 7)

The BRT summarized historical population structure information and abundance statistics for lower Columbia River Chinook salmon populations (Table A.2.5.1, BRT 2003). The abundance of natural-origin spawners ranges from near extirpation for most of the spring-run populations, to over 7,841 for the Lewis River bright late fall bright population. The majority of the fall-run tule populations have a substantial fraction of hatchery spawners in the spawning areas and may be sustained largely by hatchery production. Exceptions are the Coweeman population and the East Fork Lewis portion of the Lewis River/Salmon Creek population, which have few hatchery fish spawning on the natural spawning areas.

Hatchery programs to enhance Chinook salmon fisheries in the lower Columbia River began in the 1870s, expanded rapidly, and have continued throughout this century. Although the majority of the stocks have come from within this ESU, over 200 million fish from outside the ESU have been released since 1930. Available evidence indicates a pervasive influence of hatchery fish on natural populations throughout this ESU, including both spring- and fall-run populations (Howell et al. 1985, Marshall et al. 1995). In addition, the exchange of eggs between hatcheries in this ESU has led to the extensive genetic homogenization of hatchery stocks (Utter et al. 1989). There are seventeen artificial propagation programs releasing hatchery Chinook salmon that are considered to be part of the Lower Columbia River Chinook salmon ESU (69 FR 33102, June 14, 2004). All of these programs are designed to produce fish for harvest, with three of these programs also being implemented to augment the naturally spawning populations in the basins where the fish are released. These three programs integrate naturally produced spring Chinook salmon into the broodstock in an attempt to minimize the genetic effects of returning hatchery adults that spawn naturally.

Hatchery programs have increased total returns and numbers of fish spawning naturally, thus reducing risks to ESU abundance.

Figure 7. Natural Spawning Escapement For Lower Columbia River Tule Populations



Although these hatchery programs have been successful at producing substantial numbers of fish, their effect on the productivity of the ESU in-total is uncertain. Additionally, the high level of hatchery production in this ESU poses potential genetic and ecological risks to the ESU, and confounds the monitoring and evaluation of abundance trends and productivity.

The few programs that regularly integrate natural fish into the broodstock may help preserve genetic diversity within the ESU. However, the majority of hatchery programs in the ESU have not converted to the regular incorporation of natural broodstock, thus limiting this risk-reducing feature at the ESU scale. Past and ongoing transfers of broodstock among hatchery programs in different basins represent a risk to within and among population diversity. Collectively, artificial propagation programs in the ESU provide slight benefits to ESU abundance, spatial structure, and diversity, but have neutral or uncertain effects on ESU productivity (69 FR 33102, June 14, 2004).

2.1.5 Upper Willamette Chinook Salmon

Life History and Critical Habitat

Upper Willamette River spring Chinook are one of the most genetically distinct groups of Chinook in the Columbia River Basin (Myers *et al.* 2002). Historically, passage by returning adult salmonids over Willamette Falls (RKm 37) was only possible during the winter and spring high flow periods. The early run timing of Willamette River spring Chinook salmon relative to other Lower Columbia River spring run populations is viewed as an adaptation to flow conditions at the Willamette Falls. Chinook salmon begin appearing in the lower Willamette River in February, but the majority of the run ascends the Willamette Falls in April and May, with a peak in mid-May. Low flows during the summer and autumn months prevented fall run salmon from accessing the Upper Willamette River Basin. Mattson (1963) discusses the existence of a late spring run Chinook salmon that ascended the falls in June. These fish were apparently much larger (25-30 lbs. (11.4-13.6 kg)) and older (presumably 6-year-olds) than the earlier part of the run. Furthermore, Mattson (1963) speculated that this portion of the run "intermingled" with the earlier-run fish on the spawning ground and did not represent a distinct run. The disappearance of the June run in the Willamette River in the 1920s and 1930s was associated with dramatic decline in water quality in the lower Willamette River.

Spring Chinook populations in this ESU exhibit a life history pattern that includes traits from both ocean- and stream-type life histories. Smolt emigrations occur as young of the year and as age-1 fish in the fall and spring (Schroeder *et al.* 2004). Ocean distribution of Chinook in this ESU is consistent with an ocean-type life history with the majority of Chinook being caught off the coasts of British Columbia and Alaska. Spring Chinook from the Willamette River have the earliest return timing of Chinook stocks in the Columbia Basin with freshwater entry beginning in February. Adults return to the Willamette River primarily at ages 3 through 5 (King 2004). Historically, spawning occurred between mid-July and late October. However, the current spawn timing of hatchery and natural-origin Chinook is September and early October (Schroeder *et al.* 2004).

As part of its effort to develop viability criteria for Upper Willamette River Chinook, the Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) has identified historically demographically independent populations (Myers et al. 2002). Population boundaries are based on an application of Viable Salmonid Populations definition (McElhany et al. 2000). Myers et al. (2002) hypothesized that the ESU historically consisted of 7 spring-run populations. The populations identified by Myers et al. (2002) are as follows, and are used as the units of analysis in this opinion:

Clackamas - The Clackamas River population consists of naturally-produced spring Chinook and the Clackamas hatchery stock (ODFW stock #19). Most of the natural production of spring Chinook occurs above North Fork Dam on the Clackamas River. Since 1990 the broodstock collected for this hatchery program has been from fish returning to the Clackamas hatchery trap. The hatchery stock likely resembles native Clackamas fish more than any other stock of fish in the Willamette Basin. Substantial numbers of natural-origin fish have not been incorporated into the broodstock. However, since 2000, the hatchery stock has been managed as an integrated stock. This hatchery stock was designated as part of the ESU.

Molalla - The native population of spring Chinook in the Molalla River is believed to be extinct or nearly so (Myers et al. 2002). In recent years, smolts from the South Santiam Hatchery have been outplanted into the Molalla River. The South Santiam Hatchery stock (ODFW stock #24) was determined to be listed and part of the ESU.

North Santiam - The North Santiam River population consists of naturally-produced spring Chinook and the Marion Forks Hatchery stock (ODFW stock #21). This hatchery stock was developed from spring Chinook returning to the North Santiam River and was determined to be listed and part of the ESU.

South Santiam - The South Santiam River population consists of naturally-produced spring Chinook and the South Santiam Hatchery stock (ODFW stock #24). This hatchery stock was developed from spring Chinook returning primarily to the South Santiam River and was determined to be listed and part of the ESU.

Calapooia - The native population of spring Chinook in the Calapooia River is believed to be extinct or nearly so (Myers et al. 2002). In recent years, live adults from the South Santiam Hatchery have been outplanted into the Calapooia River. The South Santiam Hatchery stock (ODFW stock #24) was determined to be listed and part of the ESU.

McKenzie - The McKenzie River population consists of naturally-produced spring Chinook and the McKenzie hatchery stock (ODFW stock #23). This hatchery stock was developed from spring Chinook returning primarily to the McKenzie River and was determined to be listed and part of the ESU.

Middle Fork Willamette - The Middle Fork Willamette population consists of naturally-produced spring Chinook and the Willamette hatchery stock (ODFW stock #22). This hatchery stock was developed from spring Chinook returning to the Middle Fork Willamette River and was determined to be listed and part of the ESU. A small run of native spring Chinook also existed historically in Fall Creek, a tributary to the Middle Fork, and is also included in this population.

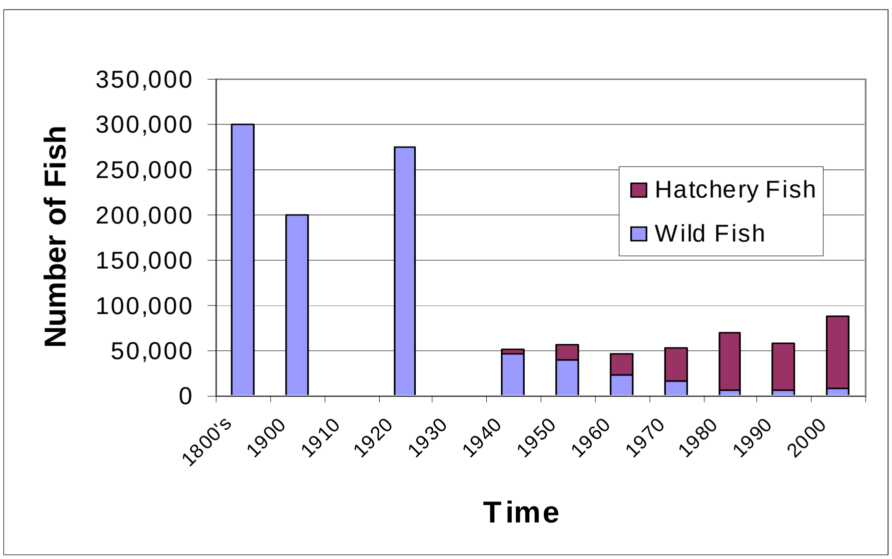
Critical habitat for the Upper Willamette River Chinook ESU was designated on February 16, 2000 (65 FR 7764), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

Distribution and Trends

The BRT report (2003) did not address individual VSP parameters for this ESU. Recent abundance of natural-origin spawners, recent fraction of hatchery-origin spawners, and current and historical habitat availability for Upper Willamette Chinook are summarized in Figure 8 and Table 8.

Clackamas - The Clackamas River still supports a relatively healthy run of natural-origin and hatchery-origin fish. Counts of natural-origin fish at North Fork Dam, located on the mainstem Clackamas River below the major natural production areas, numbered more than 2,200 fish in 2002 and 3,600 fish in 2003 (King 2004), and has averaged about 1,600 adults from 1996-2003 (Schroeder et al. 2004). It is important to note that this count represents a high estimate and the true number of natural fish is likely lower because some hatchery fish did not have an external fin clip during this time period. Nearly all of the natural production within this subbasin occurs upstream of North Fork Dam (Schroeder et al. 2002, 2003, 2004). The Clackamas River is one of two areas within the ESU with the highest return of natural-origin fish in recent years (the McKenzie is the other river). The number of hatchery fish observed at the dam (which were not allowed to pass upstream) was 3,000 to 6,000 fish in 2002 and 2003.

Figure 8. Estimated total abundance of spring Chinook returning to the mouth of the Willamette River (Myers *et al.* 2002; King 2003; King 2004).



Molalla - A small population of spring Chinook salmon existed historically in the Molalla. In recent years, few naturally-produced fish have been observed. Smolts from South Santiam hatchery have been stocked into the Molalla and represent most of the hatchery fish on the spawning grounds. In 2002 and 2003, less than 7% of the natural spawners were of natural-origin (Schroeder et al. 2003, 2004). The hatchery spring Chinook released into the Molalla are from South Santiam stock. This non-local hatchery stock makes up most of the spawners present in this river. Few redds have been observed from natural or hatchery fish. In 2003, a year of large returns of Chinook throughout the Willamette Basin, Schroeder et al. (2004) observed 15 redds in over 11 miles of surveyed stream. The BRT (2003) found that this population was likely extirpated, or nearly so.

Table 8. Historical populations of Upper Willamette spring-run Chinook Salmon

Population	Hatchery Fraction (%)	Potential Current habitat (Km)	Potential Historical Habitat (Km)	Current to Historical Habitat Ratio (%)
Clackamas River	64	369	475	78
Molalla River	>93	432	688	63
North Santiam River	97	173	269	64
South Santiam River	>84	445	658	68
Calapooia River	estimated @ 100%	163	253	65
McKenzie River	26	283	382	74
Middle Fork Willamette River	>77	197	425	43
Total		2,063	3,150	65

North Santiam - The total return of spring Chinook to the North Santiam River has numbered in the thousands of fish annually. However, from 2000 to 2003 (the first years when hatchery fish could be differentiated from wild fish), the average number of natural-origin fish was only 384 fish. In 2003, an estimated 681 natural-origin fish passed Bennett Dams on the lower North Santiam River compared to more than 11,000 hatchery fish (Firman et al. 2004). The BRT (2003) did not consider this population to be self-sustaining.

South Santiam - The estimated abundance of natural-origin fish returning to the South Santiam River in 2002 and 2003 (the only years when 100% of the hatchery fish returns could be differentiated from naturally-produced fish) was 965 and 635 adults, respectively (Firman et al. 2003, 2004). Even though these numbers are low, it is encouraging to see some natural production for this population. Since most of the naturally spawning fish are of hatchery-origin, it is likely that most of the naturally-produced fish are from hatchery parents. Most of these natural-origin fish were released into historic habitat above Foster Dam (impassable dam). The return of hatchery fish to the South Santiam has numbered several thousand fish annually. High densities of redds have been observed below Foster Dam in recent years. In 2003, more than 600 redds were counted below the dam. Most of the spawners are hatchery fish (Schroeder et al. 2004). The BRT (2003) concluded this population is not self-sustaining.

Calapooia - The Calapooia River historically supported a population of spring Chinook that numbered in the range of a few hundred fish. It is believed the historic population is extinct, with limited future production potential (Myers et al. 2002). Recent spawning ground surveys have shown few redds, even though hatchery adult spring Chinook are outplanted into the Calapooia River from South Santiam Hatchery. In 2003, even though 140 hatchery Chinook were outplanted into the Calapooia River (Firman et al. 2004), Schroeder et al. (2004) observed only two redds in 7.9 miles of survey. Over 90% of the carcasses recovered were hatchery fish. The Calapooia natural spring Chinook population is believed to be extirpated, or nearly so (BRT 2003).

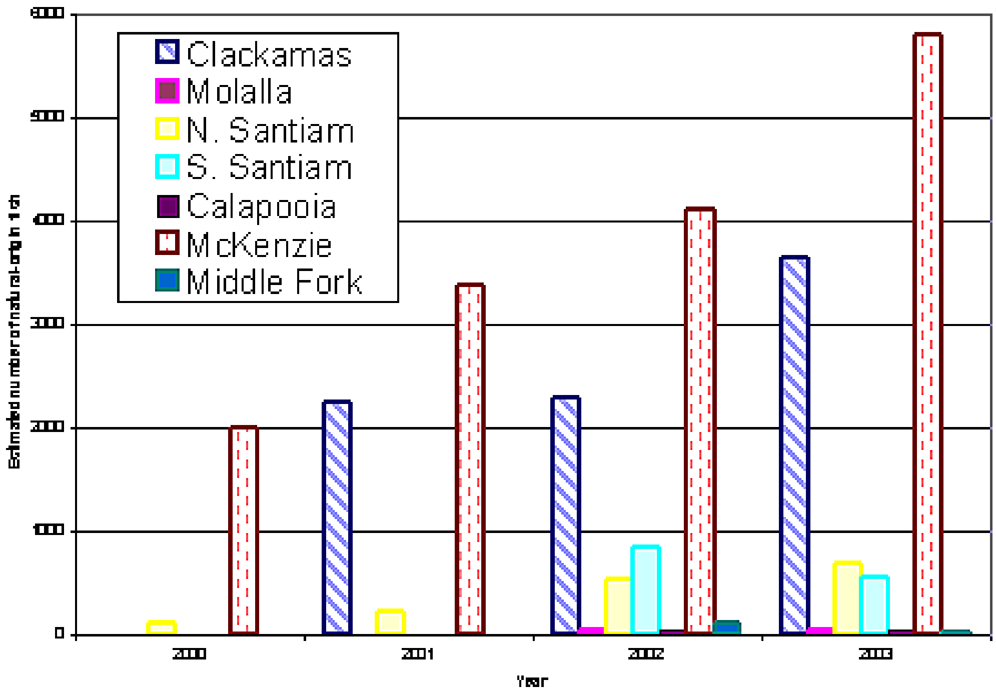
<u>McKenzie</u> - The McKenzie River is only one of two rivers in the ESU where most of the historic habitat is still accessible (Clackamas River is the other river). The McKenzie River still supports a run of natural-origin fish that numbers in the thousands annually (King 2004). The run of naturally-produced spring Chinook in the McKenzie River is the stronghold for the ESU. Since 1994, the number of naturally-produced adults has ranged from less than 1,000 fish to more than 5,700 fish in 2003 (the highest count since wild fish counting began in 1994) (Figure 9). The returns of natural fish to the McKenzie is greater than any other river in the ESU. The average number of natural fish at Leaburg Dam from 1994 to 2003 is 2,100 adults. Prespawning mortality rates of adult spring Chinook in the McKenzie are the lowest (7% to 21% for 2001-03) observed for any Willamette tributary (Schroeder *et al.* 2004).

Returns of hatchery spring Chinook to the McKenzie have also numbered in the thousands of fish annually since the early 1970s (NMFS 2004b). The BRT (2003) stated it was difficult to determine if this population would be naturally self-sustaining because of the presence of naturally-spawning hatchery fish above Leaburg Dam (the area where most of the natural production occurs).

<u>Middle Fork Willamette</u> - Over 80% of the historic habitat for spring Chinook was blocked by the construction of Dexter, Lookout Point, and Hills Creek dams in the Middle Fork basin. Since 2001, hatchery spring Chinook can be distinguished from naturally-produced fish because they have an adipose fin clip. In 2002 and 2003, an estimated 987 and 147 adults, respectively, were naturally-produced spring Chinook (Firman et al. 2004). Most of these fish were likely produced from outplants of adult hatchery fish above the dams because juvenile and adult survival below Dexter Dam is poor (Schroeder et al. 2002, 2003). The returns of hatchery spring Chinook to the Middle Fork have numbered in the thousands of fish annually since the early 1970s. In 2002 and 2003, more than 6,000 hatchery spring Chinook were collected at Dexter Dam. Returns of hatchery fish of this magnitude were common since 1970. The BRT (2003) did not consider this population to be self-sustaining.

As a whole, the BRT (2003) considered hatchery production to be a potential risk factor to natural fish in the Upper Willamette River Chinook ESU. The BRT was concerned that hatchery fish were masking the productivity of the natural populations, interbreeding with natural fish thereby posing genetic risks, and that hatchery-origin adult returns promote fisheries that increase mortality on natural fish. The BRT concluded that most natural populations are likely extirpated, or nearly so. The only population considered potentially self-sustaining is the McKenzie. However, hatchery fish comprise a substantial proportion of the run.

Figure 9. Estimated returns of natural-origin fish to each population area. Actual number of spawners is lower in the N. Santiam, S. Santiam, McKenzie, and Middle Fork due to prespawning mortality. For these rivers, estimates are from dam counts. In the Molalla and Calapooia Rivers, estimates are number of spawners.



2.1.6 Columbia River Chum Salmon

Life history and critical habitat

Historically, chum salmon were distributed throughout the coastal regions of western Canada and the United States, as far south as Monterey Bay, California. Presently, major spawning populations are found only as far south as Tillamook Bay on the northern Oregon coast.

Chum salmon (*Oncorhynchus keta*) are semelparous, spawn primarily in freshwater and, apparently, exhibit obligatory anadromy (there are no recorded landlocked or naturalized freshwater populations) (Randall et al. 1987). Chum salmon spend more of their life history in marine waters than other Pacific salmonids. Chum salmon usually spawn in the lower reaches of rivers, with redds usually dug in the mainstem or in side channels of rivers from just above tidal influence to nearly 100 km from the sea. Juveniles outmigrate to seawater almost immediately after emerging from the gravel that covers their redds (Salo 1991). This ocean-type migratory behavior contrasts with the stream-type behavior of some other species in the genus Oncorhynchus (e.g., coastal cutthroat trout, steelhead, coho salmon, and most types of Chinook and sockeye salmon), which usually migrate to sea at a larger size, after months or years of freshwater rearing. This means that survival and growth in juvenile chum salmon depend less on freshwater conditions (unlike stream-type salmonids which depend heavily on freshwater habitats) than on favorable estuarine conditions. Another behavioral difference between chum salmon and species that rear extensively in freshwater is that chum salmon form schools, presumably to reduce predation (Pitcher 1986), especially if their movements are synchronized to swamp predators (Miller and Brannon 1982).

The Columbia River chum ESU includes all naturally spawned populations of chum salmon in the Columbia River and its tributaries in Washington and Oregon (64 FR 14508; March 25, 1999). Three artificial propagation programs are considered to be part of the ESU: the Chinook River (Sea Resources Hatchery), Grays River, and Washougal River/Duncan Creek chum hatchery programs. NMFS has determined that these artificially propagated stocks are genetically similar to the natural populations and have proposed to include them as part of the listed ESU (69 FR 33102, June 14, 2004).

Critical habitat for the Columbia River chum ESU was designated on February 16, 2000 (65 FR 7764), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

<u>Distribution and trends</u>
Chum salmon in the Columbia River once numbered in the hundreds of thousands of adults and, at times, approached a million per year (BRT 2003, Figure E.2.2.2). The total number of chum salmon returning to the Columbia River in the last 50 years has averaged perhaps a few thousand per year, returning to a very restricted subset of the historical range (BRT 2003). Currently, significant spawning occurs in only two of the 17 historical populations, meaning that 88% of the historical populations are extirpated, or nearly so (BRT 2003). The two extant populations are at Grays River and the Lower Gorge (BRT 2003) The status of individual populations and groups of populations are discussed below.

As part of its effort to develop viability criteria for Columbia River chum salmon, the Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) has identified historically demographically independent populations (Myers et al. 2002). Population boundaries are based on an application of Viable Salmonid Populations definition (McElhany et al. 2000). Myers et al. (2002) hypothesized that the ESU historically consisted of 16 populations (Figure E.2.2.1). The populations identified in Myers et al. (2002) are used as the units for the new analyses in this report.

The WLC-TRT partitioned Columbia River chum salmon populations into a number of "strata" based on ecological zones (McElhany et al. 2002). The WLC- TRT analysis suggests that a viable ESU would need multiple viable populations in each of these strata. The strata and associated populations for chum are identified in Table 10. The Washington Department of Fish and Wildlife (WDFW) has conducted analyses of Columbia River chum salmon populations using the Ecosystem Diagnosis and Treatment (EDT) model, which attempts to predict fish population performance based on input information about reach-specific habitat attributes.

Table 10. Historical population structure of Columbia River chum populations. The populations are portioned into ecological zones which are based on ecological community and hydrodynamic patterns.

Ecological Zone	Population	EDT Estimate of Historical Abundance [1]
Coastal	Youngs Bay	ND
	Grays River	7,511
	Big Creek	ND
	Elochoman River	ND
	Clatskanie River	ND
	Mill, Abernathy, Germany	ND
	Scappoose Creek	ND
Cascade	Cowlitz River	141,582
	Kalama River	9,953
	Lewis River	89,671
	Salmon Creek	ND
	Clackamas River	ND
	Sandy River	ND
	Washougal river	15,140
Gorge	Lower Gorge Tributaries	>3,141
	Upper Gorge Tributaries	>8,912
	Total	>283,421

[1] The EDT estimate of historical abundance is based on analysis by WDFW of equilibrium abundance under historical habitat conditions (Busack and Rawding 2003). "ND" indicates no data.

Grays River- The majority of chum salmon spawning in the Grays River currently occurs in less than 1 mile of the river. Prior to its destruction in a 1998 flood, an artificial spawning channel created by WDFW in 1986, was the location of approximately 50% of the spawning in the Grays River population. Two time series of abundance were available for the Grays River chum salmon population (Table 11). One data set by Hymer and others was available on Stream net and covered the years 1944-2000. The other data set covers the years 1967-1998 and was provided by Dan Rawding of WDFW to correct some perceived errors in the expansions used in the Hymer *et al.* data set. The Rawding estimates are believed to be more accurate, but both data sets are included in this report because the Hymer *et al.* series includes estimates both earlier and more recent than the Rawding data set. The Rawding data set shows a small upward trend and λ from 1967-1998 (Table 12) and a low probability that the population is declining (Table 13). However, the longer Hymer et al. data set indicates both long- and short-term trends are negative over the period 1950-2000, with a high probability that the trend and A values are less than one. There was insufficient data to estimate the short-term trend (i.e. since 1990) using the Rawding data (BRT 2003).

Table 11. Recent abundance estimates for subset of Columbia River chum populations. Two different time series estimates are available for the Grays River Population.

Population		Years for Recent Means	Recent Geometric Mean	Recent Arithmetic Mean
Grays River	Rawding estimate	1994-1998	704	812
	Hymer *et al.* estimate	1996-2000	331	576
Lower Gorge		1996-2000	425	490

[1] The majority of Columbia River chum currently spawn as part of either the Grays River or Lower Gorge Populations

Table 12. Trend and growth rate for subset of Columbia chum populations (95% C.I. are in parentheses).

Population		Years of Time Series	Long-Term		Short-Term	
			Trend in Abundance	Median Growth Rate (Iv)	Trend in Abundance	Median Growth Rate (Iv)
Grays River	Rawding estimate	1967-1998	1.058 (1.021-1.096)	1.043 (0.957 -1.137)	Not enough data	Not enough data
	Hymer *et al.* estimate	1951-2000	0.990 (0.965-1.016)	0.954 (0.855-1.064)	0.904 (0.661-1.235)	0.807 (0.723-0.900)
Lower Gorge		1950-2000	0.979 (0.961-0.997)	0.984 (0.883-1.096)	1.003 (0.882-1.141)	1.001 (0.899-1.116)

[1] The long-term analysis used the entire data set (see Table C.2.4.2 for years). Short-term data sets include data from 1990 to the most recent available year. The λ calculation is an estimate of what the natural growth rate would have been after accounting for hatchery-origin spawners. Two different time series estimates are available for the Grays River Population.

Table 13. Probability that the abundance trend or growth rate of Columbia River chum salmon is less than one.

Population		**Years of Time Series**	**Long- Tenn**		**Short- Tenn**	
			Prob. Trend <1	**Prob. λ < 1**	**Prob. Trend <1**	**Prob. λ < 1**
Grays River	Rawding estimate	1967-1998	0.001	0.197	Not enough data	Not enough data
	Hymer *et al.* estimate	1951-2000	0.776	0.774	0.759	0.934
	Lower Gorge	1950-2000	0.987	0.657	0.478	0.494

[1] The λ calculation is an estimate of what the natural growth rate would have been after accounting for hatchery-origin spawners. Two different time series estimates are available for the Grays River Population.

Survey crews handled over 7,000 chum salmon carcasses in the Grays River in 2002, but the total population size is in the neighborhood of 10,000 adults (BRT 2003). However, a new chum salmon hatchery program in the Grays River started in 1999 confounds the abundance estimates as hatchery returns are included in the 10,000 adult estimate. The hatchery fish were otolith marked, so it will be possible to determine the fraction of hatchery-origin spawners once the otoliths are read, but that information is not available at this time. The Chinook River is a sub-population of the Grays River population that had essentially no chum salmon in recent years, prior to 2002 return of hatchery fish. In 2002, a preliminary estimate of 600 chum salmon returned to the Chinook River, suggesting a 1% return of 3-year-olds from the hatchery fish. No estimates of abundance for 2003 and 2004 were available at the time of this opinion, though runs was described as ".. .large, though not as large as 2002."

Lower Gorge Population- The Lower Gorge population consists of a number of subpopulations immediately below Bonneville dam. The subpopulations include Hardy Creek, Hamilton Creek, Ives Island, and the Multnomah area. Both the Ives Island and Multnomah area sub-populations spawn in the Columbia mainstem. The time series used for analysis of the Lower Gorge population is based on summing the abundance in the Hardy Creek, Hamilton Creek, and the artificial spawning channel in Hamilton Creek (Tables 11-13 above). There is some question about whether or not these data provided a representative index of the population, as it does not include the mainstem spawning areas (BRT 2003). Chum salmon may alternate between the tributaries and the mainstem, depending on flow conditions, causing counts in only a subset of the population to be poor indicators of the total population abundance in any given year. Based on these data, the population has shown a downward trend since the 1950s and has been at relatively low abundance up to 2000. However, preliminary data indicate that the 2002 abundance has shown a substantial increase estimated at greater than 2,000 chum salmon in the Hamilton and Hardy creeks, plus another 8,000 or more in the mainstem. There have been no hatchery releases in the lower gorge population, so hatcheries are not responsible for this increase in 2002 unless there has been long distance straying from Grays River (>100km). Potential causes of the 2002 increase are discussed below. No estimates of 2003 and 2004 abundance were available at the time of this opinion, though run was described as ".. .large, though not as large as 2002."

Washougal Population- Chum salmon were recently observed (within the last 3-4 years) to be spawning in the mainstem Columbia River on the Washington side, near the 1-205 bridge (at Woods Landing and Rivershore). These spawners would be considered part of the WLC TRT's Washougal population, as that is the nearest tributary mouth. It is not clear if this is a recently established population or only recently discovered by WDFW. Genetic analysis indicates that the fish currently spawning in this area are more closely related to fish in the lower gorge area than to fish in Grays River (Marshall 2001). In 2000, WDFW estimated 354 spawners at this location (BRT 2003 Figure E.2.2.8). As with the two other Columbia chum salmon spawning populations, preliminary data indicate a dramatic increase in 2002. Preliminary estimates put the 2002 abundance of this population in the range of several thousand spawners. No estimates of 2003 and 2004 abundance were available at the time of this opinion, though run was described as ".. .large, though not as large as 2002."

Upper Gorge Population- A large portion of the upper gorge population chum salmon habitat is believed to have been inundated by Bonneville Dam. However, small numbers of chum salmon still pass Bonneville Dam (BRT 2003, Figure E.2.2.9). The number of fish passing Bonneville showed some increase in 2002, but not the dramatic increases estimated in the other three populations.

Other Washington populations- In 2000, the Pacific States Marine Fisheries Commission conducted a study to determine the distribution and abundance of chum salmon in on the Washington side of the Columbia River. The results of that survey are shown in Figure E.2.2.8. of the BRT (2003) report. Very small numbers of chum salmon were observed in several locations, but with the possible exception of the Washougal River mainstem ("I-205) population (discussed above), none of the populations would be considered close to self-sustaining abundances.

Oregon populations- Chum salmon spawn on the Oregon side of the lower gorge population (Multnomah area), but appear to be essentially absent from other populations in the Oregon portion of this ESU. In 2000, ODFW conducted surveys with a similar purpose to the WDFW 2000 surveys (e.g., to determine the abundance and distribution of chum salmon in the Columbia). Out of 30 sites surveyed, only one chum salmon was observed. With the exception of the Lower Gorge population, Columbia chum salmon are considered extirpated, or nearly so, in Oregon (BRT 2003).

Reason for recent increase in abundance

It is not known why the Columbia chum salmon dramatically increased in abundance since 2002. Several hypotheses have already been floated regarding this increase. These include:

- Improved ocean conditions
- Grays River and Chinook River hatchery program
- Columbia river mainstem flow agreements (the lower gorge population is in the tailrace of Bonneville Dam and subject to hydrosystem induced flow fluctuations)
- Favorable freshwater conditions
- Increased sampling effort (Since the 2000 survey, effort seems to have increased, though this alone certainly does not explain the apparent increase).

These are all possible contributors to the increase, but the reason for the increase is not known, just as it is not known exactly why chum salmon were restricted to low abundance and limited distribution for the last 50 year. It does not appear that chum salmon have expanded their range since 2002 beyond the Grays River, Lower Gorge, and I-205 areas. Since the cause of the recent increase is unknown, it is impossible to know if it will continue.

Loss of habitat from barriers

An analysis was conducted by Steel and Sheer (2002) to assess the number of stream km historically and currently available to salmon populations in the Lower Columbia River Table 14). Stream km usable by salmon are determined based on simple gradient cut offs and on the presence of impassable barriers. This approach will over estimate the number of usable stream km, as it does not take into consideration habitat quality (other than gradient). This is likely especially true of chum salmon with seem to prefer particular microhabitats for spawning.

Table 14. Loss of habitat for Columbia River chum from barriers.

Population	Potential Current Habitat (Kilometers)	Potential Historical Habitat (Kilometers)	Current to Historical Habitat Ratio (percent)
Youngs Bav	269	287	94
Gravs River (Hymer)	229	230	100
Grays River (Rawding)	229	230	100
Big Creek	369	407	91
Elochoman River	242	242	100
Clatskanie River	160	165	97
Mill, Abernathy, Germanv	266	306	87
ScaDDoose Creek	888	1,048	85
Cowlitz River	114	120	95
Kalama River	382	579	66
Lewis River	319	362	88
Salmon Creek	416	471	88
Clackamas River	148	194	76
Sandy River	125	240	52
Washougal river	81	82	99
Lower Gorge Tributaries	55	77	71
Upper Gorge Tributaries	4,292	5,041	85

2.1.7 Snake River Sockeye Salmon

Life history and critical habitat

Snake River sockeye salmon adults enter the Columbia River primarily during June and July. Arrival at Redfish Lake, which now supports the only remaining run of Snake River sockeye salmon, peaks in August, and spawning occurs primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for 3 to 5 weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean (Bell 1986). Migrants leave Redfish Lake during late April through May (Bjornn et al. 1968) and travel almost 900 miles to the Pacific Ocean. Smolts reaching the ocean remain inshore or within the influence of the Columbia River plume during the early summer months. Later, they migrate through the northeast Pacific Ocean (Hart 1973, Hart and Dell 1986). Snake River sockeye salmon usually spend 2 to 3 years in the Pacific Ocean and return in their fourth or fifth year of life. For detailed information on the Snake River sockeye salmon, see Waples et al. (1991).

The SR sockeye salmon ESU includes populations of sockeye salmon from the Snake River basin, Idaho (extant populations occur only in the Salmon River subbasin). Under NMFS' interim policy on artificial propagation (58 FR 17573), the progeny of fish from a listed population that are propagated artificially are considered part of the listed species and are protected under ESA. Thus, although not specifically designated in the 1991 listing, SR sockeye salmon produced in the captive broodstock program are included in the listed ESU. Given the dire status of the wild population under any criteria (16 wild and 264 hatchery-produced adult sockeye returned to the Stanley basin between 1990 and 2000), NMFS considers the captive broodstock and its progeny essential for recovery. Critical habitat was designated for SR sockeye salmon on December 28, 1993 (58 FR 68543).

Distribution and trends
Historically, Snake River sockeye salmon were produced in the Salmon River subbasin in Alturas, Pettit, Redfish, and Stanley lakes and in the South Fork Salmon River subbasin in Warm Lake. Sockeye salmon may have been present in one or two other Stanley basin lakes (Bjornn et al. 1968). Elsewhere in the Snake River basin, sockeye salmon were produced in Big Payette Lake on the North Fork Payette River and in Wallowa Lake on the Wallowa River (Evermann 1895, Toner 1960, Bjornn et al. 1968, Fulton 1970).

The largest single sockeye salmon spawning area was in the headwaters of the Payette River, where 75,000 were taken one year by a single fishing operation in Big Payette Lake. However, access to production areas in the Payette basin was eliminated by construction of Black Canyon Dam in 1924. During the 1880s, returns to headwaters of the Grand Ronde River in Oregon (Wallowa Lake) were estimated to have been at least 24,000 and 30,000 sockeye salmon (Cramer 1990), but access to the Grand Ronde was eliminated by construction of a dam on the outlet to Wallowa Lake in 1929. Access to spawning areas in the upper Snake River basin was eliminated in 1967 when fish were no longer trapped and transported around the Hells Canyon Dam complex. All of these dams were constructed without fish passage facilities.

There are no reliable estimates of the number of sockeye salmon spawning in Redfish Lake at the turn of the century. However, beginning in 1910, access to all lakes in the Stanley basin was seriously reduced by the construction of Sunbeam Dam, 20 miles downstream from Redfish Lake Creek on the mainstem Salmon River. The original adult fishway, constructed of wood, was ineffective at passing fish over the dam (Kendall 1912). It was replaced with a concrete structure in 1920, but sockeye salmon access was impeded until the dam was partially removed in 1934. Even after fish passage was restored at Sunbeam Dam, sockeye salmon were unable to use spawning areas in two of the lakes in the Stanley basin. Welsh (1991) reported fish eradication projects in Pettit Lake (treated with toxaphene in 1960) and Stanley Lake (treated with Fish-Tox, a mixture of rotenone and toxaphene, in 1954). Agricultural water diversions cut off access to most of the lakes. Bjornn et al. (1968) stated that, during the 1950s and 1960s, Redfish Lake was probably the only lake in Idaho that was still used by sockeye salmon each year for spawning and rearing, and, at the time of listing under ESA, sockeye salmon were produced naturally only in Redfish Lake.

Escapement to the Snake River has declined dramatically in the last several decades. Adult counts at Ice Harbor Dam declined from 3,170 in 1965 to zero in 1990 (ODFW and WDFW 1998). The Idaho Department of Fish and Game counted adults at a weir in Redfish Lake Creek during 1954 through 1966; adult counts dropped from 4,361 in 1955 to fewer than 500 after 1957 (Bjornn et al. 1968). A total of 16 wild sockeye salmon returned to Redfish Lake between 1991 and 1998 (Table 15). During 1999, seven hatchery-produced, age-3 adults returned to the Sawtooth Hatchery. Three of these adults were released to spawn naturally, and four were taken into the IDFG captive broodstock program. In 2000, 257 hatchery-produced, age-4 sockeye salmon returned to the Stanley basin (weirs at the Sawtooth Hatchery and Redfish Lake Creek). Adults numbering 243 were handled and redistributed to Redfish (120), Alturas (52), and Pettit (28) lakes, with the remaining 43 adults incorporated into the IDFG captive broodstock program at Eagle Hatchery. Returns since 2001 have continued to be low, but on generally higher than the previous decade.

Low numbers of adult Snake River sockeye salmon preclude a CRI- or QAR-type quantitative analysis of the status of this ESU. However, because only18 wild and 264 hatchery-produced adult sockeye returned to the Stanley basin between 1990 and 2000, NMFS considers the status of this ESU to be dire under any criteria.

Table 15. Returns of Snake River sockeye salmon to Lower Granite Dam and to Redfish Lake, as determined by dam count, trapping at Redfish Lake creek weir, and spawning ground surveys.

Year	Lower Granite Dam count	Adults arriving at Redfish Lake or the Sawtooth Hatchery Weir
1985	35	12
1986	15	29
1987	29	16
1988	23	4
1989	2	1
1990	0	0
1991	8	4
1992	1	1
1993	12	8
1994	2	1
1995	4	0
1996	0	1
1997	2	1
1998	3	0
1999	14	7
2000	299	*257*
2001	36	26
2002	55	22
2003	12	3
2004	110	24[1]

1 Six sockeye entered traps, 18 were seined from the pool below the Sawtooth hatchery weir.

2.1.8 Lower Columbia River coho

Life history and critical habitat

The Lower Columbia River coho ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers. Twenty-one artificial propagation programs are considered to be part of the ESU): the Grays River, Sea Resources Hatchery, Peterson Coho Project, Big Creek Hatchery, Astoria High School (STEP) Coho Program, Warrenton High School (STEP) Coho Program, Elochoman Type-S Coho Program, Elochoman Type-N Coho Program, Cathlamet High School FFA Type-N Coho Program, Cowlitz Type-N Coho Program in the Upper and Lower Cowlitz Rivers, Cowlitz Game and Anglers Coho Program, Friends of the Cowlitz Coho Program, North Fork Toutle River Hatchery, Lewis River Type-N Coho Program, Lewis River Type-S Coho Program, Fish First Wild Coho Program, Fish First Type-N Coho Program, Syverson Project Type-N Coho Program, Sandy Hatchery, and the Bonneville/Cascade/Oxbow complex coho hatchery programs. NMFS has determined that these artificially propagated stocks are genetically no more than moderately divergent from the natural populations (NMFS, 2004b).

Four additional populations are considered extirpated. The populations were grouped into three ecological zones as has been done for other ESUs including the Coastal, Cascade, and Gorge zones. There are only two populations in the Lower Columbia River coho ESU with appreciable natural production located in the Sandy and Clackamas rivers. During the 1980s and 1990s, natural spawners were not observed in the lower tributaries in the ESU. Coincident with the abundance increases in the Sandy and Clackamas populations observed since 2000, a small number of coho spawners of unknown origin has been surveyed in some lower tributaries. Approximately 40 percent of historical habitat is currently inaccessible, which restricts the number of areas that might support natural production in the future.

The Lower Columbia River coho ESU included populations with both early and late return timing. Early timed coho enter the Columbia River starting in mid-August and are in the tributaries and spawning by mid-October. Late timed coho enter the Columbia River in late September and spawn from November to February or even as late as March. The ocean migration of early timed coho is generally to the south of the Columbia River, while late timed fish are north migrating. The Sandy River has an early timed population. The Clackamas River apparently has both early and late timed populations although there is still some contention about whether the populations are distinct. Zhou and Chilcote (2004) concluded that the early stock was derived from a brief hatchery introduction effort in the 1960's. Coho returning to the Clackamas now have two peaks of return timing. There are DNA differences between the timing groups, and well as timing and spatial separation among the spawners. The two groups also appear to have different productivity characteristics. On the other hand there were only two late spawners identified in 1999 with a resulting adult return in 2002 of 183 which seems inconsistent with the idea that the early and late timed groups are really distinct and isolated. Nonetheless, the weight of evidence at this time supports the hypothesis that early and late timed populations are distinct with the late component representing the native stock. Critical Habitat for Lower Columbia coho salmon has not been designated.

Distribution and trends

The Sandy and Clackamas Rivers contain the only two populations in the ESU with significant natural production. Adult escapements to the Sandy and Clackamas are enumerated through dam counts (Table 16). Recent escapements can be compared to estimates of a full seeding escapement goal of 1,340 for the Sandy River. The ODFW currently uses a composite full seeding escapement goal of 3,800 for the Clackamas composite population for management purposes. However, Zhou and Chilcote (2004) conducted a more recent spawner recruit analysis of the early and late timed populations in the Clackamas. Escapement goals corresponding to maximum sustained yield and maximum sustained production for the early timed population were estimated to be 1,200 and 1,500, respectively. Estimates for the late timed population were far less certain. Parameter estimation is hampered by the lack of escapements beyond the range of those observed to date. With these reservations, Zhou and Chilcote recommended using 3,800 and 6,300 as tentative escapement goals associated with maximum sustained yield and maximum sustained production for management purposes pending collection of more data and further review.

The extreme loss of naturally spawning populations, the low abundance of extant populations, diminished diversity, and fragmentation and isolation of the remaining naturally produced fish confer considerable risks on the ESU. The paucity of naturally produced spawners in this ESU is contrasted by the very large number of hatchery produced adults. The abundance of hatchery coho returning to the Lower Columbia River from 2001 to 2003 ranged from 600,000 to more than one million. The BRT expressed concern that the magnitude of hatchery production continues to pose significant genetic and ecological threats to the extant natural populations in the ESU. However, these hatchery stocks collectively represent a significant portion of the ESU's remaining genetic resources. The 21 hatchery stocks considered to be part of the ESU, if managed appropriately, may prove essential to the restoration of more widespread naturally spawning populations (69 FR 33102, June 14, 2004).

All of the 21 hatchery programs included in the Lower Columbia River coho ESU are designed to produce fish for harvest, with two small programs also designed to augment the natural spawning populations in the Lewis River basin. Past artificial propagation efforts imported out-of-ESU fish for broodstock, generally did not mark hatchery fish, mixed broodstocks derived from different local populations, and transplanted stocks among basins throughout the ESU. The result is that the hatchery stocks considered to be part of the ESU represent a homogenization of populations. Several of these risks have recently begun to be addressed by improvements in hatchery practices. Out-of-ESU broodstock is no longer used, and near 100-percent marking of hatchery fish is employed to afford improved monitoring and evaluation of broodstock and (hatchery- and natural-origin) returns. However, many of the within-ESU hatchery programs do not adhere to best hatchery practices. Eggs are often transferred among basins in an effort to meet individual program goals, further compromising ESU spatial structure and diversity.

Programs may use broodstock that does not reflect what was historically present in a given basin, limiting the potential for artificial propagation to establish locally adapted naturally spawning populations.

Table 16. Dam Counts of Adult Coho Salmon at Marmot Dam in the Sandy River, and the North Fork Dam in the Clackamas River.

Return Year	Marmot Dam Adult Coho	North Fork Dam Adult Coho		
		Early	Late	Total
1978	426	310	473	783
1979	682	648	1,320	1,968
1980	645	125	3,067	3,192
1981	620	772	398	1,170
1982	722	1,439	1,105	2,544
1983		85	1,514	1,599
1984	798	285	398	683
1985	1445	2,305	1,010	3,315
1986	1546	1,412	2,964	4,376
1987	1205	568	852	1,420
1988	1506	1,124	587	1,711
1989	2182	872	1,406	2,278
1990	376	383	342	725
1991	1491	1,855	1,268	3,123
1992	790	1,649	1,827	3,476
1993	193	104	55	159
1994	601	1,977	886	2,863
1995	697	1,047	617	1,664
1996	180	86	2	88
1997	116	1,266	18	1,284
1998	247	407	250	657
1999	159	160	54	214
2000	730	1,954	634	2,588
2001	1400	3,181	1,879	5,060
2002	310	643	360	1,003
2003	1177	1,707	398	2,105
2004	1047	1,145	230	1,375

As discussed above, the majority of the ESU's genetic diversity exists in the hatchery programs. Although these programs have the potential of preserving historical local adaptation and behavioral and ecological diversity, the manner in which these potential genetic resources are presently being managed poses significant risks to the diversity of the ESU in-total. At present, the Lower Columbia River coho hatchery programs reduce risks to ESU abundance and spatial structure, provide uncertain benefits to ESU productivity, and pose risks to ESU diversity. Overall, artificial propagation mitigates the immediacy of ESU extinction risk in the short-term but is of uncertain contribution in the long term (69 FR 33102, June 14, 2004).

2.1.9 Upper Columbia Steelhead

<u>Life history and critical habitat</u>

The life-history patterns of upper Columbia steelhead are complex. Adults return to the Columbia River in the late summer and early fall; most migrate relatively quickly up the mainstem to their natal tributaries. A portion of the returning run overwinters in the mainstem reservoirs, passing over the upper mid-Columbia dams in April and May of the following year. Spawning occurs in the late spring of the calendar year following entry into the river. Juvenile steelhead spend 1 to 7 years rearing in freshwater before migrating to the ocean. Smolt outmigrations are predominately age 2 and age 3 juveniles. Most adult steelhead return after 1 or 2 years at sea, starting the cycle again. Although the life history of this ESU is similar to that of other inland steelhead, smolt ages are some of the oldest in the West Coast (up to 7 years old), probably due to ubiquitous cold water temperatures (Mullan et al. 1992). Adults spawn later than most downstream populations, remaining in freshwater up to a year before spawning.

An initial set of population definitions for the Upper Columbia steelhead ESU along with basic criteria for evaluating the status of each population were developed using the Viable Salmonid Population (VSP) guidelines described in McElhany et al. (2000). The definitions and criteria are described in Ford et al. (2000) and have been used in the development and review of Mid-Columbia PUD plans and the FCRPS Biological Opinion. The interim definitions and criteria are being reviewed as recommendations by the Interior Columbia Technical Recovery Team. Briefly, the joint technical team recommended that the Wenatchee River, the Entiat River and the Methow River be considered as separate populations within the Upper Columbia Steelhead ESU. The Okanogan River may have supported a fourth population; the committee deferred a decision on the Okanogan to the Technical Recovery Team (BRT 2003). For the purpose of this consultation, we assume that the ESU included populations in the Wenatchee, Entiat, and Methow/Okanogan Rivers.

Critical habitat for the Upper Columbia River steelhead ESU was designated on August 18, 1997 (62 FR 43937), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

<u>Distribution and trends</u>

Upper Columbia River steelhead inhabit the Columbia River reach and its tributaries upstream of the Yakima River. This region includes several rivers that drain the east slopes of the Cascade Mountains and several that originate in Canada (only U.S. populations are included in the ESU). Dry habitat conditions in this area are less conducive to steelhead survival than in many other parts of the Columbia basin (Mullan et al. 1992).

Estimates of the annual returns of upper Columbia steelhead populations are based on dam counts. Returns of both hatchery and naturally produced steelhead to the upper Columbia River have increased in recent years (Table 17). Priest Rapids Dam is below Upper Columbia River steelhead ESU production areas and therefore is used as an indicator for returns to the ESU as a whole. The average 2000-2004 return to Priest Rapids Dam is approximately 18,735 steelhead. The average for the previous five years (1994-1998) was 7,207 fish. The total returns of upper Columbia River continue to be predominately hatchery-origin fish. The natural-origin percentage of the run over Priest Rapids increased to over 25% in the 1980s, then dropped to less than 10% in the mid-1990s. The average percent of natural-origin fish for 2000-2004 was 18.5%. The natural-origin component of the annual steelhead run over Priest Rapids increased from an average of 985 (1995-1999) to 3,454 (2000-2004) compared to an interim abundance target of 5,500 (Lohn 2002).

More specific estimates of escapement to individual production areas are based on subsequent dam counts. The estimate of the combined natural-origin steelhead return to the Wenatchee and Entiat rivers increased from 500 during years 1994-1998 to 1,938 during years 1999-2003. This compares to an interim abundance target of 3,000 (Lohn 2002).

The Methow River is the primary production area above Wells Dam with relatively little production in the Okanogan. The number of natural-origin fish returning to the Methow and Okanogan has increased from 174 during 1994-1998 to 664 during 1999-2003. This compares to an interim abundance target of 2,500 natural-origin returns (Lohn 2002). The return of hatchery fish has also increase substantially in recent years with a recent five year average (1999-2003) of 8,328.

Natural-origin returns have increased in recent years, but the productivity of these populations is less clear. Population growth is substantially influenced by assumptions regarding the relative effectiveness of hatchery spawners. Two sets of assumptions were used in estimating λ and generating return-per-spawner series for upper Columbia steelhead data sets. These assumptions represented the extremes in the range of possible outcomes relative to hatchery effectiveness values. Relative hatchery effectiveness is assumed to equal 1 or 0 with respect to fish of natural origin. Under the assumption that hatchery effectiveness is 0, naturally produced fish returning in a year are the progeny of the natural-origin returns one brood cycle earlier. Under the assumption that hatchery effectiveness is 1.0, natural-origin steelhead returning in any given year are assumed to be the product of total (hatchery plus natural-origin) spawners.
Both short-term and long-term estimates of λ are positive under the assumption that hatchery fish have not contributed to natural production in recent years. λ estimates under the assumption that hatchery fish contributed at the same level as wild fish to natural production are substantially less than 1, which means that the population is not self-sustaining.

Return-per-spawner patterns for the two steelhead production areas are also substantially influenced by assumptions regarding the relative effectiveness of hatchery origin spawners. Under the assumption that hatchery and wild spawners are contributing equally to the subsequent generation of natural-origin returns, return-per-spawner levels have been consistently below 1.0 since 1976. Under this scenario natural production would be expected to decline rapidly in the absence of hatchery spawners. Under the assumption that hatchery fish returning to the upper Columbia do not contribute to natural production, return-per-spawner levels were above 1 until the late 1980s. Return-per-spawner estimates subsequently dropped below replacement (1.0) and remained low until the most recent brood years (BRT 2003). The actual contribution of hatchery returns to natural spawning remains a key uncertainty for upper Columbia steelhead. This information need is in addition to any considerations for long-term genetic impacts of high hatchery contributions to natural spawning.

Because of concerns related to the low abundance of some of the populations and apparent shortfalls in system productivity, NMFS has authorized several steelhead supplementation programs in the upper Columbia River basin. Efforts are underway to diversify broodstocks used for supplementation in an effort to minimize the differences between hatchery and natural-origin fish and to minimize the concerns associated with supplementation. NMFS expects that the supplementation program will benefit the listed fish due to the early life history survival advantage expected from the hatchery action. However, there are also substantive concerns about the long term effect on the fitness of natural-origin populations resulting from continuous long term infusion of hatchery-influenced spawners (Busby et al. 1996). In summary, the hatchery component of the Upper Columbia River listed steelhead is abundant. The natural-origin component was quite depressed through most of the decade of the 90's, but has rebounded in recent years. It is hoped that supplementation efforts can be used to moderate potential future declines in abundance until the necessary, long-term improvements in system productivity take effect.

Table 17. Run year returns of adult summer steelhead to Priest Rapids Dam, and to the Wenatchee/Entiat and Methow/Okanogan systems (LeFleur 2005a, LeFleur 2005b, Table 7).

	Priest Rapids		Wenatchee/Entiat		Methow/Okanogan	
Year	Total (LeFleur 2004)	Natural-Origin (LeFleur 2004)	Total	Natural-Origin	Total	Natural-Origin
1974-5	2,950					
1975-6	2,560					
1976-7	9,490					
1977-8	9,630					
1978-9	4,510					
1979-0	8,710					
1980-1	8,290					
1981-2	9,110					
1982-3	10,770					
1983-4	32,000					
1984-5	26,200					
1985-6	34,010					
1986-7	22,364	2,342	5,925	1,464	13,234	503
1987-8	14,013	4,058	5,072	2,510	5,195	871
1988-9	10,200	2,670	3,236	1,663	4,415	573
1989-0	10,718	2,685	2,748	1,556	4,608	576
1990-1	7,837	1,585	1,678	953	3,819	340
1991-2	13,968	2,799	2,551	1,612	7,715	601
1992-3	13,720	1,618	4,153	1,050	7,073	347
1993-4	5,428	890	1,517	510	2,400	191
1994-5	6,735	855	2,806	454	2,183	202
1995-6	4,370	993	2,321	709	945	116
1996-7	8,600	843	1,515	351	4,127	260
1997-8	8,942	785	962	495	4,107	111
1998-9	5,847	928	564	488	2,668	182
1999-0	8,277	1,374	1,546	515	3,557	402
2000-1	11,364	2,341	2,243	1,497	6,280	521
2001-2	30,077	5,715	6,575	4,391	18,146	853
2002-3	15,867	2,983	3,425	2,063	9,475	682
2003-4	17,727	2,836	3,897	1,224	7,505	863
2004-5	18,641	3,393				
1995-1999 Average	7,207	985				
2000-2004 Average	18,735	3,454				
Interim Target Level (Lohn 2002)		5,500		3,000		2,500

2.1.10 Snake River Steelhead

Life history and critical habitat

Resident *O. mykiss* are believed to be present in many of the drainages utilized by Snake River steelhead. Very little is known about interactions between co-occurring resident and anadromous forms within this ESU. Consequently, the following review of abundance and trend information focuses on information directly related to the anadromous form.

Snake River steelhead migrate a substantial distance from the ocean (up to 1,500 km) and use high elevation tributaries (typically 1,000-2,000 m above sea level) for spawning and juvenile rearing. Snake River steelhead occupy habitat that is considerably warmer and drier (on an annual basis) than other steelhead ESUs. Snake River basin steelhead are generally classified as summer run, based on their adult run timing patterns. Summer steelhead enter the Columbia River from late June to October. After holding over the winter, summer steelhead spawn during the following spring (March to May). Managers classify up-river summer steelhead runs into to groups based primarily on ocean age and adult size upon return to the Columbia River. A-run steelhead are predominately age-1 ocean fish while B-run steelhead are larger, predominated by age-2 ocean fish.

B-run steelhead are distinguished from the A-run component by their unique life history characteristics. B-run steelhead were traditionally distinguished as larger and older, later-timed fish that return primarily to the South Fork Salmon, Middle Fork Salmon, Selway, and Lochsa rivers. The TAC concluded that different populations of steelhead do have different size structures with populations dominated by larger fish (>77.5 cm) occurring in the traditionally defined B-run basins (TAC 1999). Larger fish occur in other populations throughout the basin, but at much lower rates. (Evidence suggests that fish returning to the Middle Fork Salmon and Little Salmon are intermediate in that they have a more equal distribution of large and small fish.)

B-run steelhead are also generally older. A-run steelhead are predominately age-1-ocean fish while most B-run steelhead generally spend two or more years in the ocean prior to spawning. The differences in ocean age are primarily responsible for the differences in the size of A and B-run steelhead. However, B-run steelhead are also thought to be larger at age than A-run fish. This may be due, at least in part, to the fact that B-run steelhead leave the ocean later in the year than A-run steelhead and thus have an extra month or more of ocean residence at a time when growth rates are generally at their greatest.

Historically there was a distinctly bimodal pattern of freshwater entry that was used to distinguish A-run and B-run fish. A-run steelhead were presumed to cross Bonneville Dam from June to late August while B-run steelhead enter from late August to October. The TAC also reviewed the available information on timing and confirmed that the majority of large fish still have a later timing as counted at Bonneville with 70% of the larger fish crossing the dam after August 26, the traditional date method cutoff for separating A and B-run fish. The timing of earlier A-run fish has shifted somewhat later thereby reducing the timing separation that was so apparent in the 60's and 70's. However, the TAC concluded that the timing of the larger, natural-origin B-run fish is unchanged (TAC 1999).

Critical habitat for the Snake River steelhead ESU was designated on August 18, 1997 (62 FR 43937), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

Distribution and trends

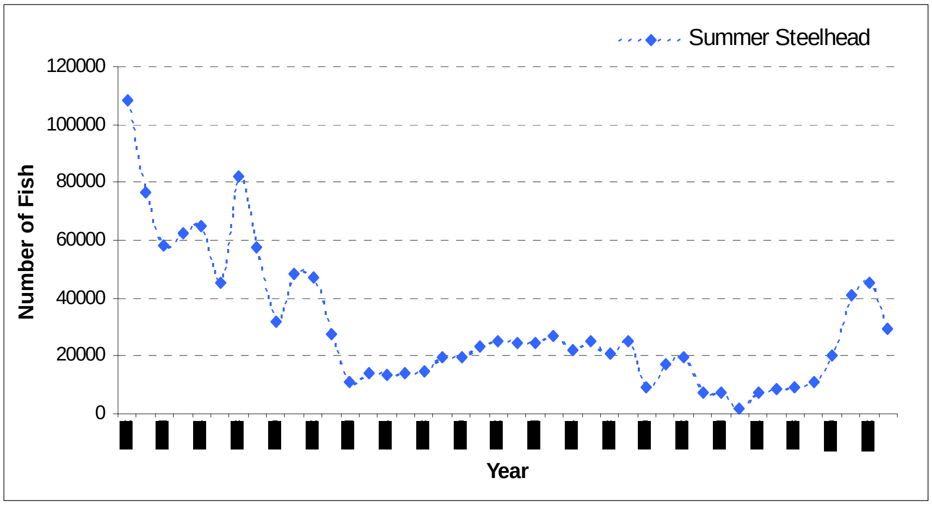
The Snake River steelhead ESU is distributed throughout the Snake River drainage system, including tributaries in southwest Washington, eastern Oregon and north/central Idaho (NMFS, 1996a). Although direct historical estimates of production from the Snake basin are not available, the basin is believed to have supported more than half of the total steelhead production from the Columbia basin (Mallet 1974). There are some historical estimates of returns to portions of the drainage. Lewiston Dam, constructed on the lower Clearwater, began operation in 1927. Counts of steelhead passing through the adult fish ladder at the dam reached 40-60,000 in the early 1960s (Cichosz et al. 2001). Based on relative drainage areas, the Salmon River basin likely supported substantial production as well. In the early 1960s, returns to the Grande Ronde River and the Imnaha River may have exceeded 15,000 and 4,000 steelhead per year, respectively (ODFW 1991). Extrapolations from tag/recapture data indicate that natural-origin steelhead return to the Tucannon River may have exceeded 3,000 adults in the mid-1950s (WDF 1992).

As pointed out above, the geographic distribution of B-run steelhead is restricted to particular watersheds within the Snake River basin (areas of the mainstem Clearwater, Selway and Lochsa Rivers, South and Middle Forks of the Salmon River). Although recent genetic data are not yet available for steelhead populations in the Salmon River, the Dworshak North Fork Hatchery (NFH) stock and natural-origin populations in the Selway and Lochsa Rivers are the most genetically distinct populations of steelhead in the Snake River basin (NMFS, unpublished). In addition, the Selway and Lochsa River populations from the Middle Fork Clearwater appear to be very similar to each other genetically, and naturally produced rainbow trout from the North Fork Clearwater River (above Dworshak Reservoir) clearly show an ancestral genetic similarity to Dworshak NFH steelhead. The existing genetic data, the restricted geographic distribution of B-run steelhead in the Snake River basin, and the unique life history attributes of these fish (i.e. larger, older adults with a later distribution of run timing compared to A-run steelhead in other portions of the Columbia River basin) clearly support the discrimination of B-run steelhead as a biologically significant and distinct component of the Snake River ESU.

With one exception (the Tucannon River production area), the tributary habitat used by Snake River steelhead ESU is above Lower Granite Dam. Major groupings of populations and/or subpopulations can be found in 1) the Grande Ronde River system; 2) the Imnaha River drainage; 3) the Clearwater River drainages; 4) the South Fork Salmon River; 5) the smaller mainstem tributaries before the confluence of the mainstem; 6) the Middle Fork salmon production areas, 7) the Lemhi and Pahsimeroi valley production areas and 8) upper Salmon

River tributaries. The Interior Columbia Basin TRT tentatively identified 24 populations in this ESU, eight of which are in the B-run production areas. Fish from six hatchery production programs are considered part of the ESU and are proposed to be included in the revised listing of the ESU (69 FR 33102, June 14, 2004).

Figure 11. Adult Returns of natural-origin steelhead at the upermost dam in the Snake river Basin



The longest consistent indicator of Snake Basin steelhead abundance is based on counts of natural-origin steelhead at the uppermost dam on the lower Snake River. Abundance of natural-origin summer steelhead at the uppermost dam on the Snake River has declined generally until quite recently (Figure 10). The general pattern has included a sharp decline in abundance in the early 1970's, modest rebuilding from the mid-1970's through the 1980's, and second period of decline during the much of decade of the 1990's. Counts at Lower Granite Dam (LGD) between 2000 and 2003 have been substantially higher with counts of wild steelhead of 20,263, 41024, 45,135, and 29,158 (Table 7). The counts in 2001-2003 are the highest observed since the early 70's.

The available data allows us to distinguish the abundance of the A-run and B-run components of Snake Basin steelhead only since 1985. Both components declined through the 90's, but the decline for B-run steelhead has been the most significant. The 4-year average count of natural-origin A-run steelhead at LGD was 17,742 beginning in 1985 compared to a recent 4-year average of 26,973, although there was an extended period of decline in between (Table 18). The comparative four year averages for natural-origin B-run steelhead were 6,062 and 6,922 (Table 18). Although the count of B-run steelhead reached a record low of just 909 fish in 1999, counts over the last four years have ranged from 2,874 in 2000 to a recent record high in 2002 of 14,377 fish.

Comparison of recent dam counts with escapement objectives provides perspective regarding the status of the ESU. The management objective from the CRFMP for Snake River steelhead was to return 30,000 natural/wild steelhead to LGD. The All Species Review (ASR) (TAC 1997) further clarifies that this objective is subdivided into 20,000 A-run and 10,000 B-run steelhead to LGD. There is also a table in the ASR that further divides the escapement goals by sub-basin (e.g., 8,000 B-run steelhead to the Clearwater River and 2,000 to the Salmon River) (Table 19).

Table 18. Lower Granite Dam Counts of Summer Steelhead

	Group A Index			Group B Index			Run Totals		
Run Year	**Wild**	Hatchery	Total	**Wild**	Hatchery	Total	**Wild**	Hatchery	Total
1985 -6	17,850	na	na	8,858	na	na	26,708	89,626	116,334
1986 -7	16,772	72,097	88,869	5,257	35,856	41,114	22,029	107,954	129,983
1987 -8	20,019	32,045	52,064	5,373	13,851	19,224	25,392	45,896	71,288
1988 -9	16,327	44,132	60,459	4,758	21,920	26,678	21,085	66,052	87,137
1989 -0	16,952	66,553	83,505	8,016	39,899	47,915	24,968	106,452	131,420
1990 -1	4,803	25,561	30,364	4,483	22,018	26,501	9,287	47,578	56,865
1991 -2	14,138	69,852	83,990	3,178	11,881	15,059	17,316	81,733	99,049
1992 -3	13,574	83,353	96,927	5,772	25,566	31,338	19,346	108,919	128,265
1993 -4	5,906	35,475	41,381	1,438	16,887	18,326	7,345	52,362	59,707
1994 -5	5,076	32,435	37,512	2,446	7,380	9,825	7,522	39,815	47,337
1995 -6	6,700	63,563	70,263	1,290	7,573	8,863	7,990	71,136	79,126
1996 -7	5,979	67,066	73,045	1,644	12,209	13,853	7,623	79,275	86,898
1997 -8	7,417	67,003	74,420	1,323	10,874	12,197	8,740	77,877	86,617
1998 -9	7,083	43,878	50,962	2,301	17,458	19,759	9,384	61,337	70,721
1999 -0	10,129	53,946	64,075	909	8,827	9,736	11,038	62,773	73,811
2000 -1	17,389	79,094	96,483	2,874	17,133	20,007	20,263	96,227	116,490
2001 -2	37,855	197,587	235,442	3,169	30,670	33,839	41,024	228,257	269,281
2002 -3	30,758	130,947	161,705	14,377	58,733	73,110	45,135	189,680	234,815
2003 -4	21,891	118,133	140,024	7,267	25,196	32,463	29,158	143,329	172,487
2004 -5									149,882

Data from IDFG. 2004-5 counts through 12/31/04

Idaho reevaluated these escapement objectives using estimates of juvenile production capacity. This alternative methodology leads to estimates of 22,160 for A-run and 32,155 for B-run steelhead (IDFG 1992). Idaho's analysis did not include escapement goal estimates for A-run steelhead returning to the Imnaha or Grand Ronde rivers. Escapement goals for these rivers were calculated here for comparison using the same methods and assumptions as were used by Idaho Department of Fish and Game (IDFG).

The four lower Columbia River tribes provided yet another set of goals for Snake River steelhead in their Tribal Restoration Plan (TRP) - Wy-Kan-Ush-Me-Wa-Kish-Wit Spirit of the Salmon (CRITFC 1995). The tribes' goals are incomplete in that they do not specify escapement objectives for either A-run or B-run steelhead in the Salmon River. The tribal goals are nonetheless generally higher than the 10,000/20,000 goals contained in the CRFMP.

NMFS recently provided interim abundance targets for Snake River steelhead (Lohn 2002). Although NMFS did not specifically associate these tributary-specific targets with A and B-run designations, they can be sub-divided based on assumptions about where run types predominate. NMFS' interim targets sum to 52,000 including 22,900 A-run and 29,100 B-run steelhead (Tucannon and Asotin targets were not included to be more comparable to the other estimates) (Table 19).

Table 19. Alternative Escapement Goals For Snake River Steelhead (TAC 2002).

Sub-basin	Stock	TAC ASR	IDFG	TRP	NMFS
Clearwater	B	8,000	16,931	12,000	17,700
Salmon	B	2,000	15,224	[a]	11,400
B-run subtotal	B	**10,000**	**32,155**	**12,000**	**29,100**
Clearwater	A	-	2,150	1,000	[c]
Salmon	A	10,000	20,010	[a]	10,200
Grand Ronde	A	8,000	*7,600*[b]	18,450	10,000
Imnaha	A	2,000	*3,100*[b]	2,100	2,700
A-run subtotal	A	**20,000**	**32,860**	**22,000**	**22,900**
Total		**30,000**	**65,015**	**34,000**	**52,000**

[a] The TRP does not identify escapement goals for A or B-run steelhead in the Salmon River.

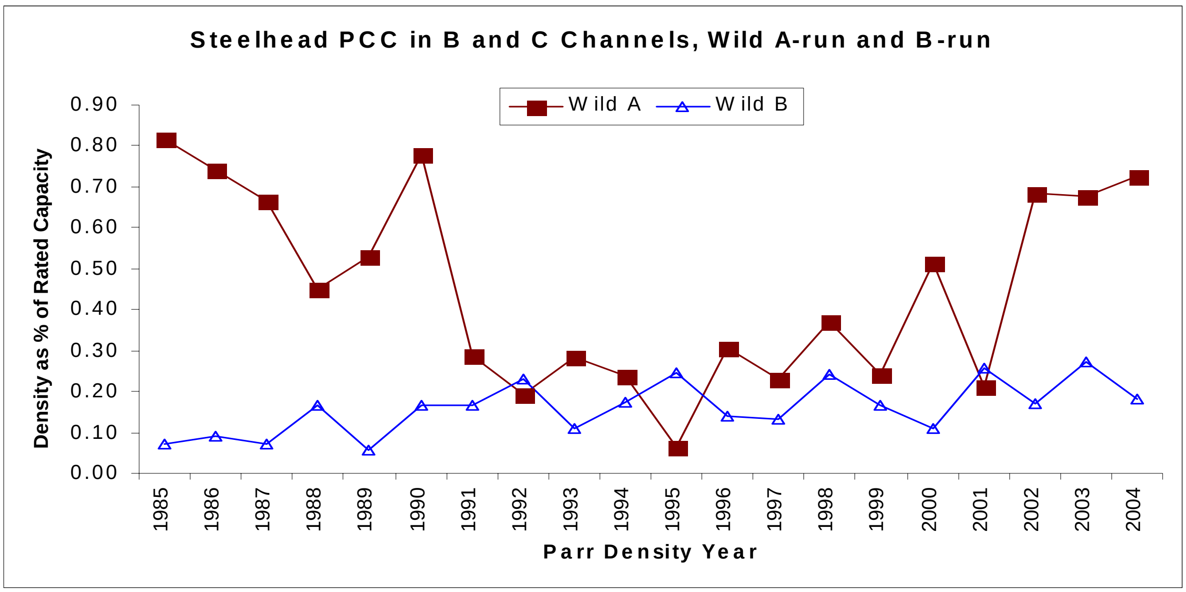
[b] Escapement goals for the Grand Ronde and Imnaha were derived from smolt estimates using the same assumptions and methods used by IDFG for Idaho subbasins.

[c] A small but unspecified proportion of the production in the Clearwater is presumably A-run fish (Lohn 2002).

Finally, the TAC recently completed a review of escapement estimates for Snake River steelhead (TAC 2002). The TAC concluded that adult escapements associated with maximum sustained production measured at LGD were likely within the range of 50,000-70,000. Escapements associated with maximum sustained yield were in the range of 25,000-55,000. These ranges can be divided equally between A and B-run steelhead. TAC's report notes that there remains significant uncertainty related to these estimates, and that additional escapements in the range of 40,000-80,000 or more would help better define the production dynamics of the system.

Idaho has conducted surveys for juvenile abundance in index areas throughout the Snake River basin since 1985 (Figure 11). Parr densities of A-run natural-origin steelhead (refers to the intermediate juvenile life stage) have declined from an about 82% of carrying capacity in 1985 to an average of about 56% in the last five years (2000-2004). Parr densities of B-run natural-origin steelhead have been low, but relatively stable since 1985. The average B-run natural-origin parr densities between 1985 and 1998 was 15%, and between 2000-2004 was 20%. Parr densities in A-run natural-origin tributaries were generally lower from 1991 through 1999, but increased in 2000 and in 2002 to 2004.

Figure 11. Percent Juvenile Carrying Capacity for A-run and B-run Steelhead



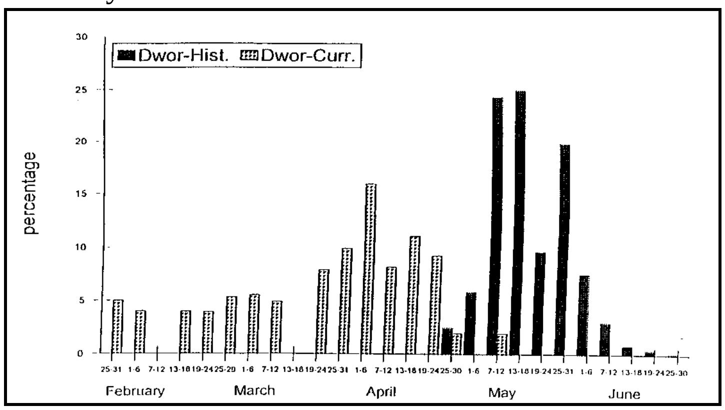
It is apparent from the available data that B-run steelhead are much more depressed than the A-run component. In evaluating the status of the Snake Basin steelhead ESU it is pertinent to consider whether B-run steelhead represent a "significant portion" of the ESU.

It is first relevant to put the Snake Basin into context. The Snake Basin historically supported over 55% of total natural-origin production of steelhead in the Columbia Basin and now has approximately 63% of the Columbia Basin's natural production potential for natural-origin steelhead (Mealy 1997). B-run steelhead include eight of the 24 populations in the ESU and occupy four major subbasins including two on the Clearwater (Lochsa and Selway) and two on the Salmon River (Middle Fork and South Fork Salmon). Some natural production of B-run steelhead also occurs in parts of the mainstem Clearwater and its major tributaries. As discussed above, there are alternative escapement objectives for B-run steelhead of 10,000 (CRFMP) and 32,700 (Idaho). NMFS' interim abundance targets for B-run steelhead production areas sum to 29,100. B-run steelhead therefore represent at least one third and as much as 55% of the production capacity of the ESU and, for consultation purposes, are considered significant portion of the ESU.

It is also apparent from the adult and juvenile abundance data that A and B-run steelhead have been depressed relative to their respective escapement goal. Both have increased in abundance in recent years, but of the two, B-run steelhead is still depressed relative to its escapement goal and relative to the apparent recent recovery of A-run steelehad.

As discussed above, B-run steelhead are the more depressed component of the ESU. However, opportunities to use hatchery supplementation for recovery purposes are limited. There is one B-run hatchery stock in the Snake Basin located at the Dworshak NFH. The Dworshak stock was developed from natural-origin steelhead from within the North Fork Clearwater, is largely free of introductions from other areas, and was included as part of the ESU although not part of the listed population. However, past hatchery practices and possibly changes in flow and temperature conditions related to Dworshak Dam have led to substantial divergence in spawn timing compared to what was observed historically in the North Fork Clearwater, and to natural-origin populations in other parts of the Clearwater Basin. The spawn timing of hatchery stocks is much earlier than it was historically (Figure 12) and this may limit the success of supplementation efforts. Past supplementation efforts in the South Fork Clearwater River using this stock have been largely unsuccessful, although better outplanting practices may yield different results. In addition, the unique genetic character of Dworshak Hatchery steelhead noted above may limit the degree to which the stock can be used for supplementation in other parts of the Clearwater and particularly in the Salmon River B-run basins. Supplementation efforts in those areas, if undertaken, will more likely have to rely on the development of local broodstocks which do not exist at this time. Supplementation opportunities in many of the B-run production areas will be limited in any case because of logistical difficulties in getting to and working in these high mountain, wilderness areas. Opportunities to accelerate the recovery of B-run steelhead through supplementation even if successful are therefore limited. Maximizing escapement of natural-origin steelhead in the near term is therefore essential.

Figure 12. Historic and Current run timing for Hatchery Stocks



2.1.11 Lower Columbia River Steelhead

<u>Life history and critical habitat</u>

The Lower Columbia River ESU includes naturally-produced steelhead returning to Columbia River tributaries on the Washington side between the Cowlitz and Wind rivers in Washington and on the Oregon side between the Willamette and Hood rivers, inclusive. In the Willamette

River, the upstream boundary of this ESU is at Willamette Falls. This ESU includes both winter and summer steelhead.

As part of its effort to develop viability criteria for Lower Columbia River steelhead, the Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) has identified historically demographically independent populations (Myers et al. 2002). Population boundaries are based on an application of Viable Salmonid Populations definition (McElhany et al. 2000). Myers et al. (2002) hypothesized that the ESU historically consisted of 17 winter-run populations and six summer-run populations for a total of 23 populations. Fish from 10 hatchery programs are considered to be part of the ESU and are proposed to be included in the revised ESU listing (68 FR 33102, June 14, 2004). Of the 17 winter-run populations, three (Cispus River, Upper Cowlitz River, and Tilton River) are extirpated (Steel and Sheer 2002). Because they were the subject of a proposal to allow an increase in the harvest rate in 2005 from 2% to 6% and thus the ones most affexted by the proposed action, in this biological opinion, we focus our discussion primarily on the remaining 14 winter steelhead populations. But also recall that NMFS considered the proosed increase in an earlier supplemental biological opinion (NMFS 2005).

The WLC-TRT partitioned Lower Columbia River steelhead populations into a number of "strata" based on major life-history characteristics and ecological zones (McElhany et al. 2002). Analysis suggests that a viable ESU would need a number of viable populations in each of these strata.

Critical habitat for the Lower Columbia River steelhead ESU was designated on March 19, 1998 (63 FR 13347), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

Distribution and trends

The Lower Columbia River ESU includes naturally-produced steelhead returning to Columbia River tributaries on the Washington side between the Cowlitz and Wind rivers in Washington and on the Oregon side between the Willamette and Hood Rivers, inclusive. In the Willamette River, the upstream boundary of this ESU is at Willamette Falls. A comparison of the current and historically available habitat indicates that habitat has been reduced for most populations. But overall, about 75% or more of the historical habitat remains (Table 20).

Recent abundance time series data are available for nine of the 14 winter-run populations. There is also information for Cedar Creek index area which is a tributary to the North Fork Lewis River. Most of the larger populations in the ESU are represented. The nine populations with abundance data represent 70% of the total potential current habitat in the ESU (from Table 20). Information for these populations is presented in Table 21.

Table 20. Historical populations of Lower Columbia River winter-run steelhead and loss of habitat from barriers[1].

Population	Potential Current Habitat (Km)	Potential Historic Habitat (Km)	Current to Historical Habitat (%)
Cispus River	0	87	0
Tilton River	0	120	0
Upper Cowlitz River	6	358	2
Coweeman River	85	102	84
Lower Cowlitz River	542	674	80
South Fork Toutle River	82	92	89
North Fork Toutle River	209	330	63
Kalama River	112	122	92
North Fork Lewis	115	525	22
East Fork Lewis	239	315	76
Salmon Creek	222	252	88
Washougal River	122	232	53
Clackamas River	919	1,127	82
Sandy River	295	386	76
Lower Gorge Tributaries	46	46	99
Upper Gorge Tributaties	31	31	100
Hood River	138	138	99

[1] The potential current habitat is the kilometers of stream below all currently impassible barriers between a gradient of 0.5% and 4%. The potential historical habitat is the kilometers of stream below historically impassible barriers between a gradient and 0.5% and 6%. The current to-historical habitat ratio is the percent–+--- of the historical habitat that is currently available

WDFW has provided escapement goals for six of the eight index areas in Washington state (Table 21). The states have management related escapement goals for several of the populations. These escapement goals presumably relate to some estimate of desired abundance level, but context for these goals is not defined. Two additional abundance goals were identified through the recent subbasin planning process (LCSRB 2004). The higher goal referred to as PFC represents the theoretical capacity if currently accessible habitat was restored to “properly functioning conditions.” The “high” escapement goal is consistent with a viable state for the population. Of the ten Lower Columbia River indicator stocks, five have been above one or more of the escapement benchmarks in recent years; some by a substantial margin (Table 21). Other populations are generally below the specified goals despite increases in recent years.

All populations, except the Sandy River population, have experienced an increase in abundance in the last three to four years, compared to the abundance level of the mid-to-late 90's (Table 21). The common trend of improved escapement is also apparent from estimates of recruit per spawner for various populations of winter steelhead in the ESU. Broodyear return rates have generally been higher for both Oregon and Washington populations since 1996 (Figures 13 and 14). LeFleur and King (2004a, b) provided estimates of the intrinsic rate of productivity for several populations for which adequate data existed (e.g., a time series longer than 12 years, known ratios of hatchery and wild spawners, age composition estimates). Intrinsic productivity estimates were developed by fitting a Ricker recruitment model to observed spawner and recruit data sets. The alpha parameter of the Ricker recruitment model, which is determined from the recruitment curve fitting exercise, was estimated for each population and was used as the index of intrinsic productivity. The results for Lower Columbia River winter steelhead populations show a range of intrinsic productivity values from 1.19 to 2.88 recruits per spawner (Table 22). The 95% confidence intervals about these point estimates were quite wide, a result of the productivity were greater than 1.0, which suggests that these populations have the capability to increase when depressed to low levels of abundance. For two populations, the 95% confidence interval included values less than 1.0.

The Biological Review Team has provided additional information on the status of the Lower Columbia River steelhead populations as part of the recent review of ESA listing status (BRT 2003). Summary statistics on population trends and growth rate from the BRT report are presented in Table 23 and Table 24. The majority of populations have a long-term (based on 14-25 years) trend less than one, indicating the population is in decline. In addition, there is a high probability for most populations that the true trend/growth rate is less than one (Table 9). Short-term trends are also generally less than 1.0 for most populations. Short-term trend analysis includes information over the last 12 or 13 years. The potential reasons for these declines have been cataloged in the WLC-TRT status reviews and include habitat degradation, deleterious hatchery practices, and climate-driven changes in marine survival (BRT 2003).

Table 21. Estimated spawner abundance of wild winter steelhead in index areas in Lower Columbia River ESU tributaries, 1984-2003 and related escapement reference points[1].

	Washington Tributaries								Oregon Tributaries		
Year	Coweeman	SF Toutle	NF Toutle	Kalama	NF Lewis (Cedar Creek Index)	Washougal	Toutle (Green Index)	EF Lewis Index	Clackamas	Sandy	Hood
1984		836		943					1,238		
1985		1,807		632			775		1,225		
1986		1,595		919				282	1,432		
1987	889	1,650		982			402	192	1,318		
1988	1,088	2,222		1,079			310	258	1,773		
1989	392	1,371	18	506			128	140	1,249		
1990	522	752	36	356			86	102	1,487		
1991		904	108	959		114	108	72	829		
1992		1,290	322	1,974		142	44	88	2,106		697
1993	438	1,242	165	843		118	84	90	1,174		397
1994	362	632	90	725		158	128	78	1,218		378
1995	68	396	175	1,030		206	174	53	1,131		194
1996	44	150	251	725	70		108		203		270
1997	108	388	183	456	78	92	132	192	273		275
1998	486	374	149	413	38	195	118	420	265		209
1999	198	562	133	478	52	294	72	476	133		290
2000	530	490	238	817	73		124		442	742	908
2001	384	348	185	922	41	216	192	328	893	902	1,000
2002	298	858	328	1,355	88	286	180	316	1,328	1,031	1,034
2003	460	1,510	410	1,699	237	764	434	624	1,230	671	717
2004	722	1,212	249	2,150	44	1,114	256	1,298	3,110	870	472
Esc. Goal	**1,064**	**1,058**		**1,000**	**328**	**520**		**204**			
High	**800**	**1,400**	**700**	**600**		**600**		**600**	**1,000**	**1,800**	**1,400**
PFC+	**1,200**	**1,900**	**3,500**	**700**		**1,000**		**1,300**	**2,000**	**3,600**	**2,800**

[1]Escapement Goals (LeFleur and Melcher 2004, High and PFC+ (Lower Columbia Salmon Recovery and Fish & Wildlife Subbasin Plan, October 2004 draft)

Figure 13. Observed recruits per spawner for three Oregon populations of Lower Columbia River ESU winter steelhead, 1993 to 1999 brood years (LeFleur and Melcher 2004).

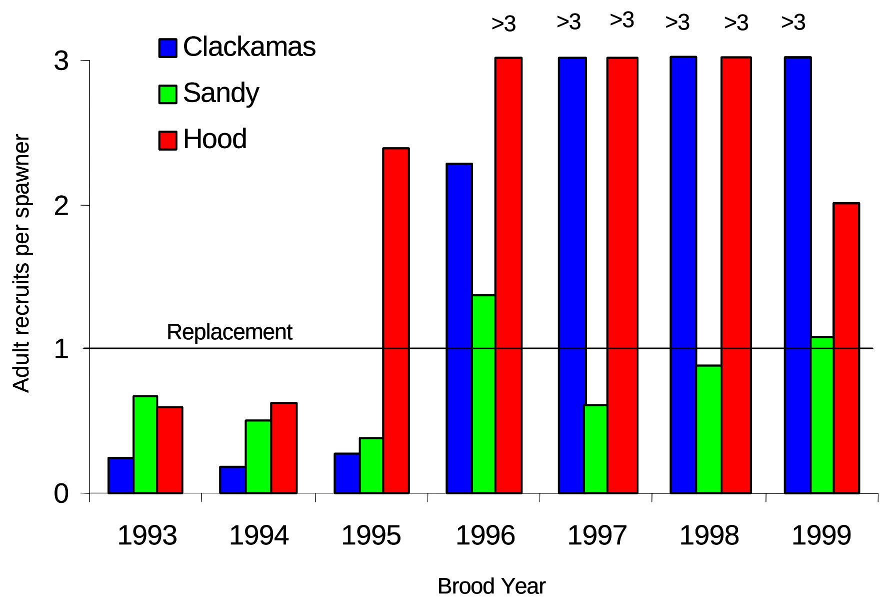


Figure 14. Observed recruits per spawner for four Washington populations of Lower Columbia River ESU winter steelhead, 1993 to 1999 brood years (LeFleur and Melcher 2004).

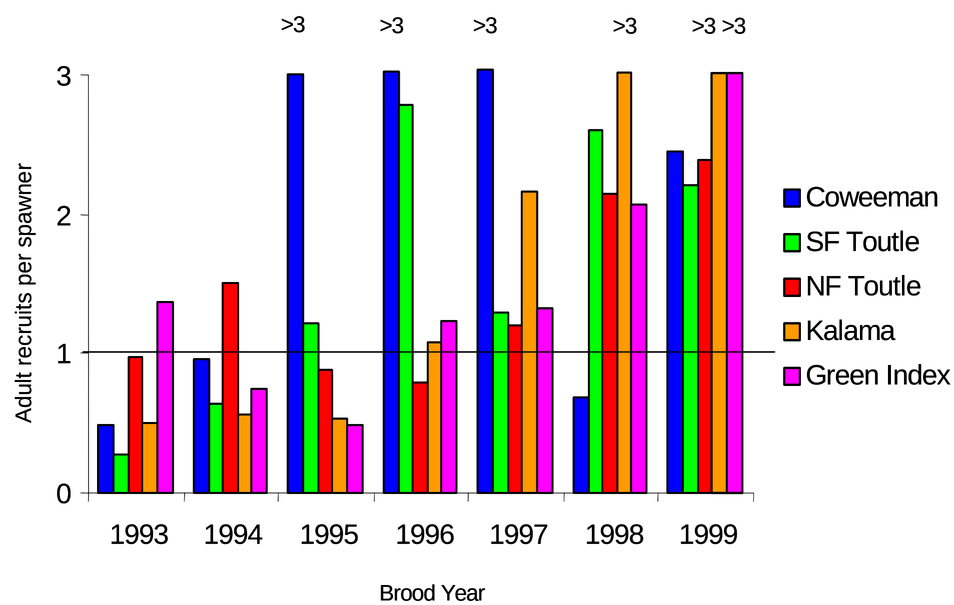


Table 22. Intrinsic productivity for Lower Columbia winter steelhead populations (LeFleur and King 2004).

Population	ESU	Sample Brood Years	Ricker Alpha Value	95% CI for Alpha Vale
NFk Toutle	LCR		2.15	1.87 - 2.48
SFk Toutle	LCR		1.19	0.65 - 2.25
Green River	LCR		2.88	1.99 - 4.17
Kalama	LCR		2.39	1.67 - 3.42
Clackamas	LCR	1980-1997	1.57	0.70 -3.53

Table 23. Trend and growth rate for subset of Lower Columbia winter steelhead populations. 95% confidence intervals are in parentheses. The long-term analysis used the entire data set (see table B.2.4.2 in the BRT report for years). The criteria for the short-term data set is defined in the methods section. In the “Hatchery = 0” columns, the hatchery fish are assumed to have zero reproductive success. In the “Hatchery = Wild” columns, hatchery fish are assumed to have the same relative reproductive success as natural-origin fish (BRT 2003).

Population	Long-Term Analysis			Short-Term Analysis		
	Trend (C.I.)	Lamda (C.I.)		Trend (C.I.)	Lambda (C.I.)	
		Hatchery = 0	Hatchery =Wild		Hatchery = 0	Hatchery =Wild
Coweeman River	0.916 (0.847-0.990)	0.908 (0.792-1.041)	0.742 (0.678-0.903)	0.941 (0.818-1.083)	0.920 (0.803-1.055)	0.787 (0.682-0.909)
South Fork Toutle River	0.917 (0.876-0.961)	0.938 (0.830-1.059)	0.933 (0.821-1.061)	0.94 (0.879-1.006)	0.933 (0.826-1.054)	0.929 (0.817-1.056)
North Fork Toutle River	1.135 (1.038-1.242)	1.062 (0915-1.233)	1.062 (0.915-1.233)	1.086 (0.999-1.18)	1.038 (0.894-1.206)	1.038 (0.894-1.206)
Kalama River	0.998 (0.973-1.023)	1.10 (0.913-1.117)	0.916 (0.824-1.019)	1.004 (0.923-1.091)	0.984 (0.890-1.088)	0.922 (0.829-1.025)
Clackamas River	0.979 (0.966-0.933)	0.971 (0.901-1.047)	0.949 (0.877-1.027)	0.914 (0.806-1.036)	0.875 (0.812-0.943)	0.830 (0.767-0.898)
Sandy River	0.940 (0.919-0.960)	0.945 (0.85-1.051)	0.828 (0.741-0.925)	0.889 (0.835-0.946)	0.866 (0.797-0.985)	0.782 (0.700-0.874)

Table 24. Probability the trend or growth rate is less than one. In the "Hatchery = 0" columns, the hatchery fish are assumed to have zero reproductive success. In the "Hatchery = Wild" columns, hatchery fish are assumed to have the same relative reproductive success as natural-origin fish (BRT 2003).

Population	Long-Term Analysis			Short-Term Analysis		
	Trend	Lamda		Trend	Lambda	
		Hatchery = 0	Hatchery =Wild		Hatchery = 0	Hatchery =Wild
Coweeman River	0.985	0.936	1.000	0.822	0.851	0.995
South Fork Toutle River	0.999	0.884	0.899	0.919	0.797	0.812
North Fork Toutle River	0.005	0.063	0.063	0.026	0.135	0.135
Kalama River	0.574	0.405	0.971	0.463	0.593	0.846
Clackamas River	0.998	0.784	0.918	0.929	0.849	0.929
Sandy River	1.000	0.993	1.000	0.999	0.991	1.000

2.1.12 Upper Willamette River Steelhead

Life history and critical habitat

As part of its effort to develop viability criteria for the Upper Willamette River steelhead ESU, the Willamette/Lower Columbia Technical Recovery Team (WLC-TRT) has identified historically demographically independent populations (Myers et al. 2002). Population boundaries are based on an application of Viable Salmonid Populations definition (McElhany et al. 2000). Myers et al. (2002) hypothesized that the ESU historically consisted of at least four populations (Molalla, North Santiam, South Santiam, and Calapooia Rivers) and possibly a fifth (West Side Tributaries). There is some uncertainty about the historical existence of a historical population in the west side tributaries. All steelhead in the ESU must pass Willamette Falls, located at River Mile 27 on the Willamette River and at RM 127 from the Columbia River mouth.

Genetic analyses indicate a close genetic affinity between winter steelhead populations in the Santiam, Molalla (North Fork), and Calapooia Rivers. Steelhead descended from summer-run (Skamania) and early-run winter (Big Creek) hatchery populations are distinct from the native steelhead, which are the subject of this analysis.

Two groups of winter steelhead currently exist in the upper Willamette. The "late-run" winter steelhead exhibit the historical phenotype adapted to passing the seasonal barrier at Willamette Falls. The falls were laddered and hatchery "early-run" winter steelhead fish were released above the falls. The early-run fish were derived from Columbia Basin steelhead outside the Willamette Basin, and are considered non-native. The release of winter-run hatchery steelhead has recently been discontinued in the Willamette Basin, but some early-run winter steelhead are still returning from whatever natural production of the early-run fish that has been established. Non-native summer run hatchery steelhead are also released into the upper Willamette River.

Critical habitat for the Upper Willamette River steelhead ESU was designated on March 19, 1998 (63 FR 13347), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

Distribution and trends

An analysis was conducted by Steel and Sheer (2002) to assess the number of stream kilometers (km) historically and currently available to steelhead populations in the Upper Willamette River (Table 25). Stream km usable by salmon are determined based on simple gradient cut offs, and on the presence of impassable barriers. This approach will over estimate the number of usable stream km as it does not take into consideration habitat quality (other than gradient); however, the analysis does indicate that for all populations the number of stream km currently accessible is reduced significantly from the historical condition.

Table 25. Historical populations of Upper Willamette River steelhead and loss of habitat from barriers[1].

	Potential Current Habitat (km)	Potential Historical Habitat (km)	Current to Historical Habitat Ratio (%)
Molalla River	521	827	63
North Santiam River	210	347	61
South Santiam River	581	856	68
Calapooia	203	318	64
West Side Tributaries	1376	2053	67

Escapement information is available for all Upper Willamette River steelhead ESU populations, except for West Side Tributaries. The recent trend in wild winter steelhead abundance was in decline during the 1990's, followed by increases beginning in 2000 (Table 26). Information is also available for the ESU as a whole by evaluating passage information over Willamette Falls. The Willamette Falls data set contains information on wild winter steelhead counts from 1993 and represents the total escapement of wild winter steelhead for the Upper Willamette ESU. Counts at Willamette Falls increased by a factor of three in 2001 compared to earlier years.

Molalla River

The Molalla River currently contains three distinct runs of steelhead: native late-run winter steelhead, introduced early-run winter steelhead (from Lower Columbia River populations), and introduced Skamania summer-run steelhead (Chilcote 1997). Releases of the early-run steelhead into the Molalla were discontinued in the mid-1990s (Chilcote 1997). An abundance time series for natural-origin winter steelhead in the Molalla River shows a declining trend from 1984-1996, and an increasing trend since 1997 (Table 26).

North Santiam River
Native late-winter and introduced Skamania summer-run steelhead are both present in the North Santiam River (Chilcote 1997). Surveys done in 1940 estimated that the run of steelhead at the time was at least 2,000 fish (Parkhurst et al. 1950). Parkhurst et al. (1950) also reported that larger runs of steelhead existed in Breitenbush, Little North Santiam, and Marion Fork Rivers, which are tributaries of the North Santiam River. Native steelhead were artificially propagated at the North Santiam Hatchery beginning in 1930, when a record 2,860,500 eggs (686 females @ 4170 eggs/female) were taken (Wallis 1963). The release of hatchery propagated steelhead (late-winter run) in the North Santiam was discontinued in 1998. Recent (through 1994) average escapements to the North Santiam have averaged 1,800 fish of mixed hatchery and natural-origin (Busby et al. 1996). An abundance time series based on redd counts data from the North Santiam River show a declining trend from 1984-1995, and a stable, slightly increasing tend since 1996 (Table 26).

South Santiam River
Index areas for the South Santiam River population are divided into the Lower and Upper reaches. Native late-winter and introduced Skamania summer-run steelhead are both present in the South Santiam River. An abundance time series based on dam counts from the Upper South Santiam River show a low, but stable trend from 1984-2000, and an increasing trend since 2001. An abundance time series based on redd counts from the Lower South Santiam River shows a declining trend from 1984-1997, and a stable, slightly increasing trend since 1998 (Table 26).

Calapooia River
An abundance time series based on redd counts data from the Calapooia River show a declining trend from 1984-1997, and an increasing trend since 1998 (Table 26).

West Side Tributaries
No time series or current counts of spawner abundance for the West Side Tributaries population are available. It is questionable if there was ever a selfsustaining steelhead population on the west side. There is assumed to be little, if any, natural production of steelhead in these tributaries.

Willamette Falls Counts
Counts of natural-origin winter steelhead at Willamette Falls represent the total escapement for the Upper Willamette ESU. Natural-origin winter steelhead counts at Willamette falls averaged 3,100 fish between 1990 and 2000 (range 1,324 - 4,414), and 12,144 fish between 2001 and 2003 (range 8,601 - 16,039) (Table 26). The preseason forecast for Upper Willamette steelhead in 2005 is 12,000 (Kostow 2004) which would be comparable to the higher returns observed in recent years.

LeFleur and Melcher (2004) provided intrinsic productivity values measured for several populations for which adequate recent data existed (e.g., a time series longer than 12 years, known ratios of hatchery and wild spawners, age composition estimates). Intrinsic productivity estimates were developed by fitting a Ricker recruitment model to observed spawner and recruit data sets. The alpha parameter of the Ricker recruitment model, which is determined from the recruitment curve fitting exercise, was estimated for each population and was used as the index of intrinsic productivity. The results for Upper Willamette River winter steelhead populations show a range of intrinsic productivity values from 1.90 to 3.82 recruits per spawner (Table 27). The 95% confidence intervals about these point estimates were quite wide, a result of the relatively poor fit of the data to the assumed recruitment curve. Point estimates and the bounds of confidence for all of the intrinsic productivity estimates were greater than 1.0, which suggests that these populations have the capability to increase when depressed to low levels of abundance.

Table 26. Estimated spawner abundance of wild winter steelhead for populations in the Upper Willamette River ESU.

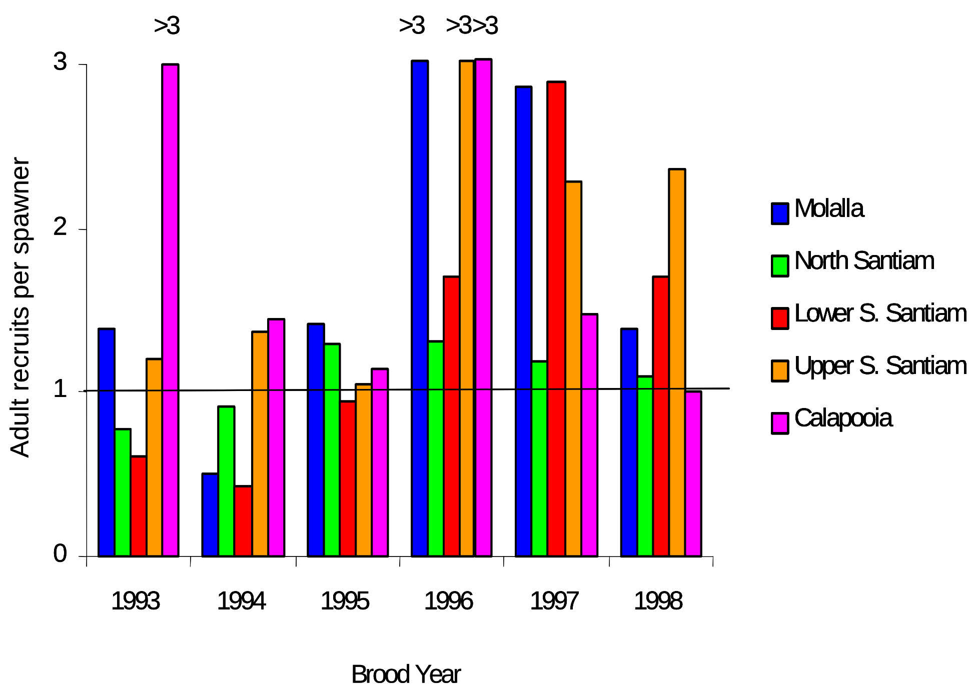
Year	Willamette Falls	Molalla	North Santiam	South Santiam		Calapooia
				Lower	Upper	
1984		2,244	4,010	1,997	504	420
1985		3,129	6,966	3,075	355	555
1986		2,226	3,944	1,964	326	407
1987		2,324	4,523	2,180	214	481
1988		2,757	2,444	2,106	656	439
1989		2,206	4,725	1,411	222	183
1990		2,155	3,707	1,846	272	360
1991		1,398	3,443	2,180	139	309
1992		1,898	2,484	1,906	361	119
1993	2,426	577	2,754	1,032	256	39
1994	3,604	2,321	2,619	1,811	234	161
1995	3,191	898	1,755	1,204	297	109
1996	1,324	398	1,955	972	131	18
1997	3,431	590	2,106	642	336	253
1998	2,179	1,411	2,835	684	359	358
1999	4,414	1,090	2,163	1,076	328	59
2000	4,315	1,898	3,021	1,499	326	225
2001	11,792	1,654	2,375	2,485	783	446
2002	16,039	2,140	3,227	1,274	1,003	351
2003	8,601	2,321	4,010	1,179	850	477
2004	11,433					

Table 27. Intrinsic productivity for Upper Willamette winter steelhead populations (LeFleur and King 2004).

Population	ESU	Sample Brood Years	Ricker Alpha Value	95% CI for Alpha Value
Molalla	UWR	1980-1997	2.64	1.45 – 4.76
North Santiam	UWR	1980-1997	1.90	1.22 – 2.94
Lower South Santiam	UWR	1980-1997	2.46	1.32 – 4.62
Upper South Santiam	UWR	1980-1997	1.95	1.38 – 2.80
Calapooia	UWR	1980-1997	3.82	1.79 – 8.25

As illustrated in Figure 15, the observed number of recruits per spawner for populations belonging to the Upper Willamette ESU during the last three brood years (1996, 1997 and 1998) was generally greater than for the first two brood years of the data set (1993 and 1994). These higher recruitment rates in recent years are also reflected by the higher escapements in recent years.

Figure 15. Observed recruits per spawner for four populations of upper Willamette ESU winter steelhead, including two sub-populations for the South Santiam, 1993 to 1997 brood years (LeFleur and Melcher 2004).



2.1.13 Middle Columbia River Steelhead

Life history and critical habitat

Life history information for steelhead of this ESU indicates that most Middle Columbia River steelhead smolt at 2 years and spend 1 to 2 years in salt water (i.e., 1-ocean and 2-ocean fish, respectively) prior to re-entering fresh water, where they may remain up to a year prior to spawning (Howell et al. 1985). Within this ESU, the Klickitat River is unusual in that it produces both summer and winter steelhead, and the summer steelhead are dominated by 2-ocean steelhead, whereas most other rivers in this region produce about equal numbers of both 1- and 2-ocean steelhead. Major drainages in this ESU are the Deschutes, John Day, Umatilla, Walla-Walla, Yakima, and Klickitat river systems. Almost all steelhead populations within this ESU are summer-run fish, the exceptions being winter-run components returning to the Klickitat, and Fifteen Mile Creek watersheds.

The ESU is in the intermontane region and includes some of the driest areas of the Pacific Northwest, generally receiving less than 40 cm of rainfall annually (Jackson 1993). Vegetation is of the shrub-steppe province, reflecting the dry climate and harsh temperature extremes. Because of this habitat, factors contributing to the decline of this ESU include agricultural practices, especially grazing, and water diversions/withdrawals. In addition, hydropower development has impacted the ESU through loss of habitat above hydro projects, and mortalities associated with migration through the Columbia River hydro system.

Blockages have prevented access to sizable steelhead production areas in the Deschutes River and the White Salmon River. In the Deschutes River, Pelton Dam blocks access to upstream habitat historically used by steelhead. Conduit Dam, constructed in 1913, blocked access to all but 2-3 miles of habitat suitable for steelhead production in the Big White Salmon River. Substantial populations of resident trout exist in both areas.

Hatchery facilities are located in a number of drainages within the geographic area of this ESU, although there are also subbasins with little or no direct hatchery influence. The John Day River system is a large river basin supporting an estimated five steelhead populations. The basin has not been outplanted with hatchery steelhead and out-of-basin straying is believed to be low. The Yakima River system includes four to five populations. Hatchery production in the basin was relatively limited historically and has been phased out since the early 1990s. The Umatilla, the Walla-Walla, and the Deschutes river systems each have ongoing hatchery production programs based on locally derived broodstocks. Straying from out-of-basin production programs into the Deschutes River has been identified as a chronic occurrence. Fish from seven hatchery programs are considered to be part of this ESU and are proposed to be included in the revised ESU listing (69 FR 33102, June 14, 2004).

Critical habitat for the Middle Columbia River steelhead ESU was designated on March 15, 1999 (57 FR 14517), but was subsequently vacated by the May 2002 court order (68 FR 55900, September 29, 2003).

Distribution and trends

The Middle Columbia River Steelhead ESU includes steelhead populations in Oregon and Washington drainages upstream of the Hood and Wind river systems to and including the Yakima River. The Snake River is not included in this ESU.

The abundance of natural-origin populations in the Middle Columbia River steelhead ESU has increased substantially over the past 5 years. The Deschutes and Upper John Day Rivers have recent 5-year mean abundance levels in excess of their respective interim recovery target abundance levels (Lohn 2002). Due to an uncertain proportion of out-of-ESU strays in the Deschutes River, the recent increases in this population are difficult to interpret. The Umatilla River recent 5-year mean natural-origin population abundance is approximately 72 percent of its interim recovery target abundance level (BRT 2003). The natural-origin populations in the Yakima River, Klickitat River, Touchet River, Walla Walla River, and Fifteenmile Creek, however, remain well below their interim recovery target abundance levels (BRT 2003). Long-term trends for 11 of the 12 production areas in the ESU were negative, although it was observed that these downward trends are driven, at least in part, by a peak in returns in the middle to late 1980s, followed by relatively low escapement levels in the early 1990s (BRT 2003). Short-term trends in the 12 production areas were mostly positive from 1990 to 2001 (BRT 2003). The continued low number of natural-origin returns to the Yakima River (10 percent of the interim recovery target abundance level, historically a major production center for the ESU) generated concern among the BRT. However, anadromous and resident *O. mykiss* remain well distributed in the majority of subbasins in the Middle Columbia River ESU. The presence of substantial numbers of out-of-basin (and largely out-of-ESU) natural-origin spawners in the Deschutes River, raised substantial concern regarding the genetic integrity and productivity of the native Deschutes population. The extent to which this straying is an historical natural phenomenon is unknown. The cool Deschutes River temperatures may attract fish migrating in the comparatively warmer Columbia River waters, thus inducing high stray rates.

The BRT noted the particular difficulty in evaluating the contribution of resident fish to ESU-level extinction risk. Several sources indicate that resident fish are very common in the ESU and may greatly outnumber anadromous fish. The BRT concluded that the relatively abundant and widely distributed resident fish in the ESU reduce risks to overall ESU abundance, but provide an uncertain contribution to ESU productivity, spatial structure, and diversity (BRT 2003b; BRT 2004a).

ESU hatchery programs may provide a slight benefit to ESU abundance. Artificial propagation increases total ESU abundance, principally in the Umatilla and Deschutes Rivers. The kelt reconditioning efforts in the Yakima River do not augment natural-origin abundance, but do benefit the survival of the natural-origin populations. The Touchet River hatchery program has only recently been established, and its contribution to ESU viability is uncertain. The contribution of ESU hatchery programs to the productivity of the three target populations, and the ESU in-total, is uncertain. The hatchery programs affect a small proportion of the ESU, providing a negligible contribution to ESU spatial structure. Overall the impacts to ESU diversity are neutral. The Umatilla River program, through the incorporation of natural-origin broodstock, likely limits adverse effects to population diversity. The Deschutes River hatchery program may be decreasing population diversity. The recently initiated Touchet River endemic program is attempting to reduce adverse effects to diversity through the elimination of out-of-ESU Lyons Ferry Hatchery steelhead stock. Collectively, artificial propagation programs in the ESU provide a slight beneficial effect to ESU abundance, but have neutral or uncertain effects on ESU productivity, spatial structure, and diversity.

2.2 Factors affecting the Environmental Baseline

Environmental baselines for biological opinions are defined by regulation at 50 CFR 402.02, which states that an environmental baseline is the physical result of all past and present state, Federal, and private activities in the action area along with the anticipated impacts of all proposed Federal projects in the action area (that have already undergone formal or early section 7 consultation). The environmental baseline for this biological opinion is therefore the result of the impacts of great many activities (summarized below) have had on the listed ESUs' survival and recovery. Put another way, the baseline is the culmination of the effects that multiple activities have had on the species' *biological requirements* and, by examining those individual effects, it is possible to describe the species' status in the action area.

Many of the biological requirements for listed ESUs in the action area can best be expressed in terms of essential habitat features. That is, the ESU requires adequate: (1) substrate (especially spawning gravel), (2) water quality, (3) water quantity, (4) water temperature, (5) water velocity, (6) cover/shelter, (7) food, (8) riparian vegetation, (9) space, and (10) migration conditions (February 16, 2000, 65 FR 7764). The best scientific information presently available demonstrates that a multitude of factors, past and present, have contributed to the decline of west coast salmonids by adversely affecting these essential habitat features. NMFS reviewed much of that information in its recently reinitiated Consultation on Operation of the Federal Columbia River Power System (FCRPS) (NMFS 2004c). That review is summarized in the sections below.

2.2.1 The Mainstem Hydropower System

Hydropower development on the Columbia River and its tributaries has dramatically affected anadromous salmonids in the basin. Dams have eliminated spawning and rearing habitat and altered the natural hydrograph of the Columbia River – decreasing spring and summer flows and increasing fall and winter flows. Power operations cause flow levels and river elevations to fluctuate – slowing fish movement through reservoirs, altering riparian ecology, and stranding fish in shallow areas. The dams in the migration corridors kill smolts and adults and alter their migrations. The dams have also converted the once-swift river into a series of slow-moving reservoirs – slowing the smolts' journey to the ocean and creating habitat for predators.

All of the listed ESUs have populations that must navigate past major hydroelectric projects during their up- and downstream migrations. Because of these migrations and the fact that all the populations experience the cumulative effects of other dam operations occurring upstream from their ESU boundary, all three ESUs are subject to all the impacts described above. For more information on the effects of the mainstem hydropower system, please see NMFS (2004c).

In brief, the construction and operation of the dams eliminated the majority of anadromous fish habitat, and has significantly affected the life history, distribution, and survival of the remaining natural-origin populations of listed ESUs. The occurrence and magnitude of floods events has been significantly altered, with implications to nutrient input, stream habitat dynamics, and the survival of juvenile fish. Current flow regimes are counter to the natural regimes observed historically. Winter and spring water releases from the dams are warmer and of lower discharge, which has accelerated egg development and fish emerge earlier than what occurred historically. Summer flows are higher and cooler than those that occurred historically. In the fall, flows are relatively high because the dams are being drawn down in preparation for the next year's winter run-off into the reservoirs.

However, ongoing biological opinions from NMFS to the Bonneville Power Administration (BPA), the U.S. Army Corps of Engineers (USACE), the USFWS, and the Bureau of Reclamation (BOR) have brought about numerous beneficial changes in the operation and configuration of the hydropower system. For example, increased spill at the dams allows smolts to avoid both turbine intakes and bypass systems; increased flow in the mainstem Columbia Rivers provides better inriver conditions for smolts; and better smolt transportation, through the addition and modification of barges in the Columbia River.

2.2.2 Human-Induced Habitat Degradation

The quality and quantity of freshwater habitat in much of the Columbia River Basin , including the Willamette sub-basin, have declined dramatically in the last 150 years. Forestry, farming, grazing, road construction, hydropower development, mining, and urban development have radically changed the historical habitat conditions of the basin. With the exception of fall Chinook salmon, which generally spawn and rear in the mainstem rivers, salmon and steelhead spawning and rearing habitat is found in the tributaries to the Columbia River.

Over 2,500 streams and river segments and lakes do not meet Federally-approved, state and Tribal water quality standards and are now listed as water-quality-limited under Section 303(d) of the Clean Water Act (CWA). Most of the water bodies in Oregon and Washington on the 303(d) list do not meet water quality standards for temperature. High water temperatures adversely affect salmonid metabolism, growth rate, and disease resistance, as well as the timing of adult migrations, fry emergence, and smoltification. Many factors can cause high stream temperatures, but they are primarily related to land-use practices rather than point-source discharges. Some common actions that cause high stream temperatures are the removal of trees or shrubs that directly shade streams, water withdrawals for irrigation or other purposes, and warm irrigation return flows. Loss of wetlands and increases in groundwater withdrawals contribute to lower base-stream flows, which in turn contribute to temperature increases. Activities that create shallower streams (e.g., channel widening) also cause temperature increases.

Pollutants also degrade water quality. Many waterways in the Columba River Basin fail to meet the Clean Water Act (CWA) and Safe Drinking Water Act (SDWA) water quality standards due to the presence of pesticides, heavy metals, dioxins and other pollutants (Willamette River Basin Task Force 1997). These pollutants originate from both point sources (industrial and municipal waste) and nonpoint sources (agriculture, forestry, urban activities, etc.). The types and amounts of compounds found in runoff are often correlated with land use patterns (e.g. fertilizers and pesticides are found frequently in agricultural and urban settings, and nutrients are found in areas with human and animal waste). People contribute to chemical pollution in the basin, but natural and seasonal factors also influence pollution levels in various ways.

Nutrient and pesticide concentrations vary considerably from season to season, as well as among regions with different geographic and hydrological conditions. Natural features (such as geology and soils) and land-management practices (such as storm water drains, tile drainage and irrigation) can influence the movement of chemicals over both land and water (Allen et al. 1999). Salmon require clean gravel for successful spawning, egg incubation, and the emergence of fry. Fine sediments clog the spaces between gravel and restrict the flow of oxygen-rich water to the incubating eggs. Excess nutrients, low levels of dissolved oxygen, heavy metals, and changes in pH also directly affect the water quality for salmon and steelhead.

Water quantity problems are also a significant cause of habitat degradation and reduced fish production. Millions of acres of land in the basins are irrigated. Although some of the water withdrawn from streams eventually returns as agricultural runoff or groundwater recharge, crops consume a large proportion of it. Withdrawals affect seasonal flow patterns by removing water from streams in the summer (mostly May through September) and restoring it to surface streams and groundwater in ways that are difficult to measure. Withdrawing water for irrigation, urban consumption, and other uses increases temperatures, smolt travel time, and sedimentation. Return water from irrigated fields can introduce nutrients and pesticides into streams and rivers.

Deficiencies in water quantity have impacted the McKenzie, mainstem Willamette, and Lower Columbia Rivers, all of which have experienced major agricultural development over the last century. Water withdrawals (primarily for irrigation) have lowered summer flows in nearly every stream in the basin and profoundly decreased the amount and quality of rearing habitat (Allen et al. 1999). In fact, in 1993, fish and wildlife agency, Tribal, and conservation group experts estimated that 80 percent of 153 Oregon tributaries had low-flow problems with two-thirds caused, at least in part, by irrigation withdrawals (OWRD 1993). The Northwest Power Planning Council (NWPPC) showed similar problems in many Oregon and Washington tributaries (NWPPC 1992).

Blockages that stop downstream and upstream fish movement exist at many dams and barriers, whether they are for agricultural, hydropower, municipal/industrial, or flood control purposes. Culverts that are not designed for fish passage also block upstream migration. Migrating fish are sometimes killed by being diverted into unscreened or inadequately screened water conveyances or turbines. While many fish-passage improvements have been made in recent years, manmade structures continue to block migrations or kill fish throughout the Columbia and Willamette basins.

On the landscape scale, human activities have affected the timing and amount of peak water runoff from rain and snowmelt. Forest and range management practices have changed vegetation types and density which, in turn, affect runoff timing and duration. Many riparian areas, flood plains, and wetlands that once stored water during periods of high runoff have been destroyed by development that paves over or compacts soil—thus increasing runoff and altering their natural hydrograph pattern. Land ownership has also played its part in the region's habitat and land-use changes. Federal lands are generally forested and are situated in the upstream portions of the watersheds. While there is substantial habitat degradation across all land ownership types, in general, habitat quality in many headwater stream sections is in better condition than in the largely non-Federal lower portions of tributaries (Doppelt et al. 1993, Frissell 1993, Henjum et al. 1994, Quigley and Arbelbide 1997). In the past, valley bottoms were among the most productive fish habitats in the basin (Stanford and Ward 1992, Spence et al. 1996, Independent Science Group (ISG) 1996). Today agricultural and urban land development and water withdrawals have significantly altered the habitat for fish and wildlife. Streams in these areas typically have high water temperatures, sedimentation problems, low flows, simplified stream channels, and reduced riparian vegetation.

At the same time habitat was being destroyed by water withdrawals in the Columbia basin, water impoundments in other areas dramatically reduced threatened critical habitat by inundating large amounts of spawning and rearing habitat and reducing migration corridors, for the most part, to a single channel. Flood plains have been reduced in size, offchannel habitat features have been lost or disconnected from the main channel, and the amount of large woody debris (large snags/log structures) in rivers has been reduced. Most of the remaining habitats are affected by flow fluctuations associated with reservoir management.

The Columbia River estuary, through which all the basin's anadromous species must pass, has also been changed by human activities. Historically, the downstream half of the estuary was a dynamic environment with multiple channels, extensive wetlands, sandbars, and shallow areas. Prior to European settlements, the mouth of the Columbia River was about four miles wide, today it is two. Winter and spring floods, low flows in late summer, large woody debris floating downstream, and a shallow bar at the mouth of the Columbia River kept the environment dynamic. Today navigation channels have been dredged, deepened, and maintained. Jetties and pile-dike fields have been constructed to stabilize and concentrate flow in navigation channels. Marsh and riparian habitats have been filled and diked, and causeways have been constructed across waterways. These actions have decreased the width of the mouth of the Columbia River to two miles and increased the depth of the Columbia River channel at the bar from less than 20 to more than 55 feet.

More than 50 percent of the original marshes and spruce swamps in the estuary have been converted to industrial, transportation, recreational, agricultural, or urban uses. More than 3,000 acres of intertidal marsh and spruce swamps have been converted to other uses since 1948 (Lower Columbia River Estuary Program [LCREP] 1999). Many wetlands along the shore in the upper reaches of the estuary have been converted to industrial and agricultural lands after levees and dikes were constructed. Furthermore, water storage and release patterns from reservoirs upstream of the estuary have changed the seasonal pattern and volume of discharge. The peaks of spring/summer floods have been reduced, and the amount of water discharged during winter has increased.

Human-caused habitat alterations have also increased the number of predators feeding on listed fish. A population of terns on Rice Island (16,000 birds in 1997) consumed an estimated 6 to 25 million outmigrating salmonid smolts during 1997 (Roby et al.1998) and 7 to 15 million outmigrating smolts during 1998 (Collis et al. 1999). Rice Island is a dredged material disposal site in the Columbia River estuary, created by the USACE under its Columbia River Channel Operation and Maintenance Program. As another example, populations of Northern pikeminnow (Ptychocheilus oregonensis—a voracious salmonid predator) in the Columbia River have proliferated in the warm, slow-moving reservoirs created by mainstem dams. Some researchers have estimated the pikeminnow population in the John Day pool alone to be over one million (Bevan et al. 1994).

To counteract all the ill effects listed in this section, Federal, state, tribal, and private entities have, singly and in partnership, begun recovery efforts to help slow and, eventually, reverse the decline of salmon and steelhead populations. Notable efforts within the range of the ESUs under this biological opinion are the Basinwide Recovery Strategy (Federal Caucus 2000), the Northwest Forest Plan (NFP), PACFISH, the Washington Wild Stock Restoration Initiative, the Oregon Plan for Salmon and Watersheds (OPSW), and the Washington Wild Salmonid Policy. Nevertheless, much remains to be done to recover salmonids in the Columbia River basin. Full discussions of these efforts can be found in the referenced documents and in the FCRPS biological opinion (NMFS 2004c).

2.2.3 Hatcheries

For more than 100 years, hatcheries in the Pacific northwest have primarily been used to (a) produce fish for harvest and (b) replace natural production lost to dam construction and other development – and in many fewer instances, to protect and rebuild naturally produced salmonid populations. As a result, most salmonids returning to the region are primarily derived from hatchery fish. In 1987, for example, 95 percent of the coho salmon, 70 percent of the spring Chinook salmon, 80 percent of the summer Chinook salmon, 50 percent of the fall Chinook salmon, and 70 percent of the steelhead returning to the Columbia River Basin originated in hatcheries (CBFWA 1990). Because hatcheries have traditionally focused on providing fish for harvest and technologies have been limited, it is only recently that the substantial adverse effects of hatcheries on natural-origin populations been demonstrated. For example, the production of hatchery fish, among other factors, has contributed to the 90 percent reduction in natural-origin coho salmon runs in the lower Columbia River over the past 30 years (Flagg et al. 1995).

NMFS has identified four primary ways hatcheries may harm wild-run salmon and steelhead: (1) ecological effects, (2) genetic effects, (3) overharvest effects, and (4) masking effects (NMFS 2000d). Ecologically, hatchery fish can predate on, displace, and compete with natural-origin fish. These effects are most likely to occur when fish are released in poor condition and do not migrate to marine waters, but rather remain in the streams for extended rearing periods. Hatchery fish also may transmit hatchery-borne diseases, and hatcheries themselves may release disease-carrying effluent into streams. Hatchery fish can affect the genetic variability of native fish by interbreeding with them. Interbreeding can also result from the introduction of stocks from other areas. Interbred fish are less adapted to the local habitats where the original native stock evolved and may therefore be less productive there.

In many areas, hatchery fish provide increased fishing opportunities. However, when natural-origin fish mix with hatchery stock in these areas, naturally produced fish can be overharvested. Moreover, when migrating adult hatchery and natural-origin fish mix on the spawning grounds, the health of the natural-origin runs and the habitat's ability to support them can be overestimated because the hatchery fish mask the surveyors' ability to discern actual natural-origin run status, thus resulting in harvest objectives that were too high to sustain the naturally produced populations.

The role hatcheries play in the Columbia basin is being redefined by NOAA Fisheries' proposed hatchery listing policy, developing environmental impact statements, and recovery planning efforts. These efforts will focus on maintaining and improving ESU viability. Research designed to clarify interactions between natural-origin and hatchery fish and quantify the effects of artificial propagation on natural-origin fish will play a pivotal role in informing these efforts. The final facet of these initiatives is to use hatcheries to create fishing opportunities with minimal impacts to listed populations (e.g., terminal area fisheries).

2.2.4 Harvest

Salmon and steelhead have been harvested in the Columbia basin as long as there have been people there. For thousands of years, native Americans have fished on salmon and other species in the mainstem and tributaries of the Columbia River for ceremonial and subsistence use and for barter. Salmon were possibly the most important single component of the native American diet, and were eaten fresh, smoked, or dried (Craig and Hacker 1940). A wide variety of gears and methods were used, including hoop and dip nets at cascades such as Celilo and Willamette Falls, to spears, weirs, and traps (usually in smaller streams and headwater areas).

Commercial fishing developed rapidly with the arrival of European settlers and the advent of canning technologies in the late 1800s. The development of non-Indian fisheries began in about 1830; by 1861, commercial fishing was an important economic activity. The early commercial fisheries used gill nets, seines hauled from shore, traps, and fish wheels. Later, purse seines and trolling (using hook and line) fisheries developed. Recreational fishing began in the late 1800s, occurring primarily in tributary locations (ODFW and WDFW 2000).

Salmonids' capacity to produce more adults than are needed for spawning offers the potential for sustainable harvest of naturally produced (versus hatchery-produced) fish. This potential can be realized only if two basic management requirements are met: (1) enough adults return to spawn and perpetuate the run, and (2) the productive capacity of the habitat is maintained. Catches may fluctuate in response to such variables as ocean productivity cycles, periods of drought, and natural disturbance events, but as long as the two management requirements are met, fishing can be sustained indefinitely. Unfortunately, both prerequisites for sustainable harvest have been violated routinely in the past. The lack of coordinated management across jurisdictions, combined with competitive economic pressures to increase catches or to sustain them in periods of lower production, resulted in harvests that were too high and escapements that were too low. At the same time, habitat has been increasingly degraded, reducing the capacity of the salmon stocks to produce numbers in excess of their spawning escapement requirements.

In recent years harvest management has undergone significant reforms and many of the past problems have been addressed. Principles of weak stock management are now the prevailing paradigm. As a result, mixed stock fisheries are managed based on the needs of natural-origin stocks. Managers also account, where possible, for total harvest mortality across all fisheries. The focus is now correctly on conservation and secondarily on providing harvest opportunity where possible directed at harvestable hatchery and natural-origin stocks.

2.2.4.1 Ocean Harvest

Ocean harvest occurs outside of the action area and it is therefore not part of the Environmental Baseline considered for this action. However, for some of the ESUs considered in this opinion, ocean harvest is significant and it is described here briefly to provide a more comprehensive overview of factors affecting the ESA listed species.

<u>Spring and Summer Chinook, and Sockeye Salmon</u>

Impacts from ocean fisheries on listed spring and summer Chinook and Sockeye salmon have been considered in recent biological opinions. NMFS (1996b) concluded that it is highly unlikely that any Snake River sockeye salmon are taken in salmon fisheries off the west coast and that, although Upper Columbia River Chinook and Snake River spring/summer Chinook salmon may on occasion be taken, the overall ocean exploitation rate is likely less than 1%.

<u>Snake River Fall Chinook</u>

Although consultation related to PFMC salmon fisheries and those that occur in Southeast Alaska and Canada are considered in separate biological opinions, ocean fisheries in general have all been subject in recent years to the same ocean exploitation rate limit for Snake River fall Chinook. The combined ocean fisheries are required to achieve a 30% reduction in the average 1988-93 base period exploitation rate on Snake River fall Chinook (Lohn and McInnis 2004).

In recent years, there have been substantial reductions in ocean fisheries in general, and in Canadian fisheries in particular. As a result, the exploitation rate reduction for combined ocean fisheries has met and exceeded the prescribed standard for Snake River fall Chinook. The base period reduction in combined ocean fisheries has averaged 54% since 1996. The expected base period reduction for the combined 2004 ocean fisheries is 67% (PFMC 2003). The 1996-2003 average annual total adult equivalent exploitation rate for Snake River fall Chinook (ocean and inriver fisheries combined) is 45% (Table 28).

Lower Columbia River Chinook

The average total exploitation rate (ocean and river combined) for tule Chinook for 1980-1995 was 64% compared to a 1996-2003 average of 39% (Table 28). The expected exploitation rate on tule stocks in 2005 is 35.9% for all ocean fisheries combined and 44.1% overall including the inriver fisheries. The total exploitation rate for 2005 will thus be below the 49% exploitation rate limit specified by NMFS (Lohn and McInnis 2005). The ocean exploitation rate on Lower Columbia River bright stocks is generally lower. The average total exploitation rate for bright Chinook for 1980-1995 was 52% compared to a 1996-2003 average of 31% (Table 28). The expected natural-origin spawning escapement of the North Fork Lewis indicator stock in 2005 is about 15,000 compared to an escapement goal of 5,700.

Lower Columbia River Coho

Lower Columbia River coho are harvested throughout their migratory range from Alaska to Oregon both in fisheries intended to harvest salmon and in fisheries directed on other species. Salmon are taken incidentally in the Bering Sea/Aleutian Islands, and the Gulf of Alaska groundfish fisheries off of the coast of Alaska. NMFS has conducted section 7 consultations on the impacts of fishing conducted under the Bering Sea and Aleutian Islands and Gulf of Alaska Fishery Management Plans of the North Pacific Fisheries Management Council on ESA listed species and concluded that impacts were not likely to jeopardize the salmon ESUs listed at that time (NMFS 1994, NMFS 1995b, NMFS 1998b, NMFS 1999b, NMFS 2000e). The bycatch in the Canadian groundfish fisheries has been considered in previous consultations on U.S. groundfish and salmon fisheries (NMFS 1992, NMFS 1999c). The conclusion was that the bycatch of listed species was not likely to be a substantial additional impact to that of the U.S., assuming that the total annual salmon bycatch in Canadian groundfish fisheries was approximately 28,000 fish per year[3] (NMFS 1999c).

[3]Assumes bycatch in other gears is similar to that of the whiting fishery.

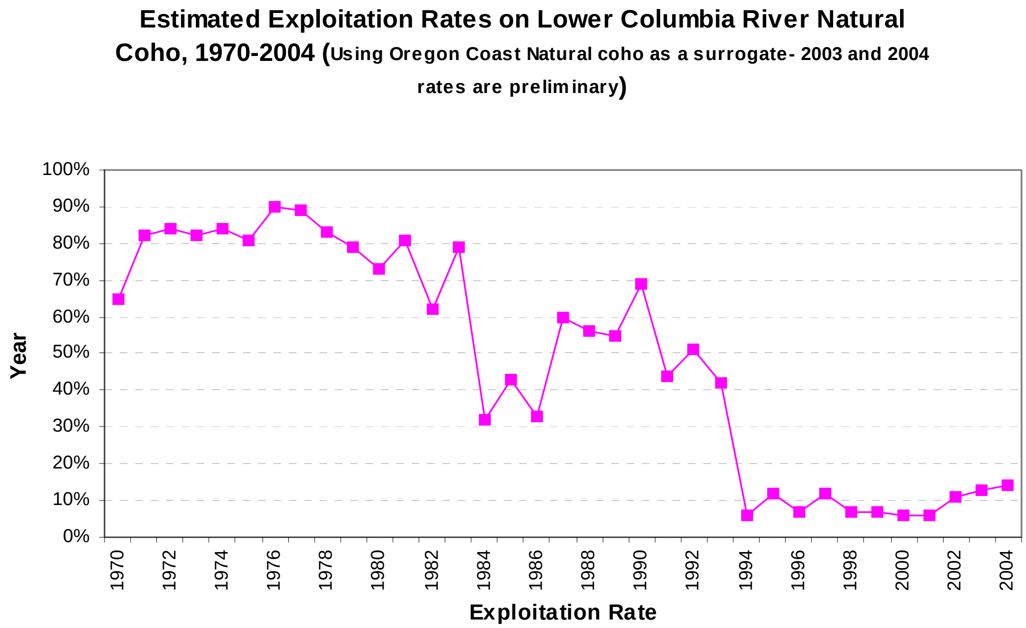
Table 28. Annual total adult equivalent exploitation rates (ocean and inriver fisheries combined) for selected Columbia River fall Chinook stocks and inriver treaty Indian harvest rates for Snake River A and B-run steelhead.

Return Year	Snake River Fall Chinook	Lower Columbia River tules	Lower Columbia River	Lower Columbia River coho	Snake River A-run Steelhead	Snake River B-run Steelhead
1980	65%	85%	70%			
1981	68%	76%	42%			
1982	63%	77%	48%			
1983	66%	63%	43%			
1984	76%	72%	58%			
1985	73%	62%	57%		19.3%	31.0%
1986	75%	73%	66%		12.6%	26.7%
1987	76%	72%	68%		14.7%	37.20%
1988	81%	84%	70%		16.1%	23.5%
1989	77%	68%	46%		14.9%	35.0%
1990	78%	67%	41%		14.1%	21.6%
1991	67%	69%	59%		14.4%	30.0%
1992	62%	66%	59%		15.2%	26.3%
1993	63%	60%	55%		14.6%	19.2%
1994	48%	34%	41%		9.7%	18.6%
1995	43%	36%	38%		10.0%	18.4%
1996	39%	26%	19%		8.6%	35.0%
1997	51%	39%	29%		10.0%	14.3%
1998	41%	29%	21%		8.4%	15.5%
1999	48%	45%	21%		7.8%	8.9%
2000	47%	40%	25%		4.3%	13.2%
2001	38%	39%	30%		3.8%	11.5%
2002	48%	49%	48%		2.7%	3.4%
2003	46%	44%	53%		4%	16.6%
2004						
mean 80-95	**66%**	**64%**	**52%**			
mean 96-03	**45%**	**39%**	**31%**			
mean 85-97					**13.4%**	**25.9%**
mean 98-03					**5.2%**	**11.5%**

Salmon fisheries off the coast of Southeast Alaska (SEAK) and British Columbia also impact listed Lower Columbia River coho salmon, although to much less degree than fisheries in the southern U.S. Historically, SEAK and British Columbian fisheries have accounted for two to seven percent of the fishery-related mortality of the ESU. In recent years, Alaskan and Canadian fisheries have accounted for less than two percent on average of the total fisheries related mortality of Lower Columbia River coho salmon (personal communication with Larrie Lavoy, WDFW, Salmon Policy Analyst, March 21, 2005).

Until recently the exploitation rates in salmon fisheries on Lower Columbia River coho have been too high, contributing to their decline, particularly because of what we now know about the effect of cycles in ocean productivity. The combined ocean and inriver exploitation rates for Clackamas River coho regularly exceeded 90 percent through the early 1984s (personal communication from Curt Melcher, ODFW, June 8, 2004). Exploitation rates began to decline in the mid-1980's (Figure 16) and present harvest rates are very low compared with those in the 1970's .

Figure 16. Estimated Ocean Exploitation Rate for Lower Columbia River Coho



Chum Salmon

Chum salmon are not caught in ocean salmon fisheries off the Washington, Oregon, and California coast managed by the PFMC (NMFS 2001a). There are fisheries directed at chum in Puget Sound and in Canada and Alaska that generally target maturing fish returning to nearby terminal areas in the fall. We have no specific information on the ocean distribution of Columbia River chum salmon, but given the timing and distant location of fisheries directed at chum, it is unlikely that Columbia River chum are significantly affected by ocean fisheries.

Steelhead

Steelhead are rarely caught in ocean fisheries and therefore ocean harvest is not considered a significant source of mortality to any of the listed steelhead ESUs considered in this biological opinion (Lohn and McInnis 2004).

2.2.4.2 Columbia Basin Harvest

There is some harvest of listed species considered in this biological opinion that occurs within the action area, but outside the scope of the proposed fisheries. This includes non-Indian fisheries in Idaho covered under other biological opinions, tributary Indian fisheries in the Snake Basin covered in a separate biological opinion, and tributary non-Indian fisheries that are being considered separately under section 4(d) of the ESA.

2.2.5 Natural Conditions

Natural changes in the freshwater and marine environments play a major role in salmonid abundance. Recent evidence suggests that marine survival among salmonids fluctuates in response to 20- to 30-year cycles of climatic conditions and ocean productivity (Hare et al. 1999). This phenomenon has been referred to as the Pacific Decadal Oscillation; this has also been referred to as the Bidecadal Oscillation (Mantua et al. 1997). The variation in ocean conditions has been an important contributor to the decline of many stocks. It is apparent that ocean conditions that affect the productivity of Pacific northwest salmon populations have been in a low phase of the cycle for some time. However, recent information suggests that ocean conditions may have undergone a substantive change beginning in 1999 as indicated by cooler ocean temperatures, changes in species composition of zooplankton, fewer pelagic predators such as hake and mackerel, and the increased abundance of bait fish (B. Emmett, NMFS, pers. comm., w/ P. Dygert, NMFS, June 7, 2001). Many stocks in the Columbia Basin and along the west coast have shown substantial increases in abundance, in some cases to record levels in recent years.

The effect of improving ocean conditions is discussed in the recent proposed listing notice (69 FR 33102, June 14, 2004). In summary, the FR notice cautions that even under the most optimistic scenario, increases in abundance might be only temporary and could mask a failure to address underlying factors for decline. The real conservation concern for West Coast salmon and *O. mykiss* is not how they perform during periods of high marine survival, but how prolonged periods of poor marine survival affect the VSP parameters of abundance, growth rate, spatial structure, and diversity. It is reasonable to assume that salmon populations have persisted over time, under pristine conditions through many such cycles in the past. Less certain is how the populations will fare in periods of poor ocean survival when their freshwater, estuary, and nearshore marine habitats are degraded.

Salmon and steelhead are exposed to high rates of natural predation, particularly during freshwater rearing and migration stages. Ocean predation may also contribute to substantial natural mortality, although it is not know to what degree. In general, salmonids are prey for pelagic fishes, birds, and marine mammals, including harbor seals, sea lions, and killer whales. There have been recent concerns that the rebound of seal and sea lion populations – following their protection under the Marine Mammal Protection Act of 1972 – has caused a substantial number of salmonid deaths.

2.2.6 Scientific Research

ESA-listed and other fish in the Columbia River Basin are the subject of scientific research and monitoring activities. Most biological opinions NMFS issues recommend specific monitoring, evaluation, and research projects to gather information to aid the survival of listed fish. In addition, NMFS has issued numerous research permits authorizing takes of ESA-listed fish over the last few years. Each authorization for take by itself would not lead to decline of the species. However the sum of the authorized takes indicate a high level of research effort in the action area, and as anadromous fish stocks have continued to decline, the proportion of fish handled for research/monitoring purposes has increased. The effect of these activities is difficult to assess because despite the fact that fish are harassed and even killed in the course of scientific research, these activities have a great potential to benefit ESA-listed salmon and steelhead. For example, aside from simply increasing what is known about the listed species and their biological requirements, research is essentially the only way to answer key questions associated with difficult resource issues that crop up in every management arena and involve every salmonid life history stage (particularly the resource issues discussed in the previous sections). Perhaps most importantly, the information gained during research and monitoring activities can help resource managers recover listed species. That is, no rational resource allocation or management decisions can be made without the knowledge to back them up. Further, there is no way to tell if the corrective measures described in the previous sections are working unless they are monitored and no way to design new and better ones if research is not done.

In any case, scientific research and monitoring efforts (unlike the other factors described in the previous sections) are not considered to be a factor contributing to the decline of listed salmonids, and NMFS believes that the information derived from the research activities is essential to their survival and recovery. Nonetheless, fish are harmed during research activities. And activities that are carried out in a careless or undirected fashion are not likely to benefit the species at all. Therefore, to reduce adverse effects from research activities on the species, NMFS imposes conditions in its permits so that Permit Holders conduct their activities in such a way as to minimize adverse effects on the ESA-listed species, including keeping mortalities as low as possible. Also, researchers are encouraged to use non-listed fish species and hatchery fish instead of listed naturally-produced fish when possible. In addition, researchers are required to share fish samples, as well as the results of the scientific research, with other researchers and co-managers in the region as a way to avoid duplicative research efforts and to acquire as much information as possible from the ESA-listed fish sampled. NMFS also works with other agencies to coordinate research and thereby prevent duplication of effort.

In general, for projects that require a section 10(a)(1)(A) permit, applicants provide NMFS with high take estimates to compensate for potential inseason changes in research protocols, accidental catastrophic events, and the annual variability in listed fish numbers. Also, most research projects depend on annual funding and the availability of other resources. So, a specific research project for which take of ESA-listed species is authorized by a permit may be suspended in a year when funding or resources are not available. As a result, the overall take in a given year for all research projects, as provided to NMFS in post-season annual reports, is usually less than the authorized level of take in the permits and the related NMFS biological opinion on the issuance of those permits. Therefore, because actual take levels tend to be lower than authorized takes, the severity of effects to the ESA-listed species due to the conduct of scientific research activities are usually less than the effects analyzed in a typical biological opinion.

2.2.7 Summary

In conclusion, given all the factors for decline—even taking into account the corrective measures being implemented—it is still clear that the affected ESU's biological requirements are currently not being met under the environmental baseline. Some of the ESUs are responding favorably to improved natural conditions and actions taken to reduce human-induced mortality. However, the survival and recovery of the species depends on their ability to also persist through periods of low ocean survival. Thus circumstances are such that there must be a continued improvement in the environmental conditions (over those currently available under the environmental baseline). Any further degradation of the environmental conditions could have a large impact because these ESUs are already at risk. In addition, efforts to minimize impacts caused by dams, harvest, hatchery operations, and habitat degradation must continue.

3.0 EFFECTS OF THE ACTION

The purpose of this section is to identify what effects NMFS' issuance of an incidental take statement will have on ESA listed salmonid ESUs in the Columbia River. To the extent possible, this will include analyzing effects at the population level. Where information on listed salmonid ESUs is lacking at the population level, this analysis assumes that the status of each affected population is parallel to that of the ESU as a whole. The method NMFS uses for evaluating effects is discussed first, followed by discussions of the general effects fishery activities are known to have.

3.1 Evaluating the Effects of the Action

3.1.1 Application of ESA Section 7(a)(2) Standards – Jeopardy Analysis Framework

This section reviews the approach used in this Opinion to apply the standards for determining the likelihood of jeopardy to listed species and adverse modification of critical habitat as set forth in Section 7(a)(2) of the ESA and as defined in 50 CFR Part 402 (the consultation regulations)[4]. This Opinion's application of authorities has been revised to specifically address the Court's concerns and other legal precedents as explained in the recent 2004 FCRPS opinion (NMFS 2004c).

[4]Application of the definition in these regulations of "destruction or adverse modification" (50 CFR §402.02) is under further consideration in light of a recent court decision in this Circuit, *Gifford Pinchot Task Force v. USFWS*, No. 03-35279 (9th Cir. August 6, 2004).

Information related to steps one and two is discussed in preceding sections. Information related to steps three, four and five is discussed in the following sections.

In conducting analyses of actions under Section 7 of the ESA, NOAA Fisheries takes the following steps, as directed by the consultation regulations:

– Evaluates the current status of the species at the ESU level with respect to biological requirements indicative of survival and recovery and the essential physical and biological features of any designated critical habitat.

– Evaluates the relevance of the environmental baseline in the action area to biological requirements and the species' current status, as well as the status of any designated critical habitat.

– Determines whether the proposed action reduces the abundance, productivity, or distribution of the species or alters any physical or biological features of designated critical habitat

– Determines and evaluates any cumulative effects within the action area.

– Evaluates whether the effects of the proposed action, taken together with any cumulative effects and added to the environmental baseline, can be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of the affected species, or is likely to destroy or adversely modify their designated critical habitat. (See CFR § 402.14(g).)

If, in completing step 5, NOAA Fisheries determines that the action under consultation is likely to jeopardize the continued existence of ESA-listed species or adversely modify designated critical habitat, NOAA Fisheries must identify a reasonable and prudent alternative (RPA) for the action that is not likely to jeopardize the continued existence of ESA-listed species or adversely modify their designated critical habitat and meets the other regulatory requirements for an RPA (see 50 CFR § 402.02).

3.2 Effects on Habitat

Previous sections have described the habitat of the affected ESA listed ESUs in the Columbia River, the essential features of that habitat, and depicted its present condition. The discussion here focuses on how those features are likely to be affected by the proposed action.

Most of the harvest related activities occur from boats or along river banks with most of the fishing activity in the mainstem Columbia River. The gears that would be used include hook-and-line, drift and set gillnets, and hoop nets. These types of gear do not substantially affect the habitat. There will be minimal disturbance to vegetation, and negligible harm to spawning or rearing habitat, or to water quantity and water quality. Thus, there will be minimal effects on the essential habitat features of the affected species from the actions discussed in this biological opinion, certainly not enough to contribute to a decline in the values of the habitat. While harvest activities do affect passage in that fish are intercepted, those impacts are accounted for explicitly in the following analyses regarding harvest related mortality.

3.3 Effects on ESA Listed Salmonid ESUs

3.3.1 Factors to Be Considered

Fisheries may affect salmonid ESUs in several ways which have bearing on the likelihood of continued survival of the species. Immediate mortality effects accrue from the hooking or netting and subsequent retention of individual fish — those effects are considered explicitly in this opinion. In addition, mortalities may occur to any fish which is caught and released alive This is important to consider in the review of fishery management actions, as catch-and-release mortalities primarily result from implementation of management regulations designed to reduce mortalities to listed fish through live release. The catch-and-release mortality rate varies for different gear types, different species, and different fishing conditions, and those values are often not well known. Catch-and-release mortality rates have been estimated from available data and applied by the TAC in the calculation of impacts to listed fish evaluated in this consultation. The TAC applies a 10% incidental mortality rate to salmon caught and released during recreational fishing activities. The TAC also applies a 1% incidental mortality rate to salmon caught and released using dipnets. Catch and release mortality associated with selective tanglenet and gillnet fisheries during the winter and spring season are 18.5% and 30%, respectively. Estimates of catch-and-release mortality are combined with landed catch estimates when reporting the expected total mortality, and so are also specifically accounted for in this biological opinion.

The states and tribes propose to manage their fisheries subject to various harvest rate caps for individual ESUs or ESU components. In some cases the parties presume that the fisheries will be managed up to the specified limit or cap. In other cases, there are differences between the harvest rate cap and the expected harvest rate, which is less than the cap. For example, Snake River fall Chinook are considered one of the key limiting stocks, and fisheries are likely to be managed up to the 31.29% harvest rate limit. Alternatively, the states propose to manage their fisheries subject to a 2% harvest rate limit on natural-origin steelhead. However, the expectation is that the fall Chinook limit will be reached before the steelhead limit is reached. The expected harvest rate on A-run steelhead for each of the ESUs is generally less than 2% (Table 29). In discussing the effects of the action, a distinction is therefore made, where appropriate, between a proposed harvest rate cap and the anticipated harvest rate resulting from the proposed fishery.

3.3.2 Effects of the Proposed Action

The states and tribes propose fisheries with several management objectives that are described in the biological assessment (LeFleur 2005a, LeFleur 2005b) and the associated 2005-07 Management Agreement (*U.S. v Oregon* Parties 2005). Table 29 lists all affected ESUs and the expected impacts (harvest rates) by non-Indian fisheries and treaty Indian Fisheries, based on the Interim Management Agreement.

Snake River Fall Chinook

Harvest rates on Snake River natural-origin fall Chinook in 2005-2007 are limited to a maximum of 31.29%. This harvest rate represents a 30% reduction in the harvest rate relative to the 1988-93 base period. The parties have further agreed to allocate the harvest rate cap 8.25% to non-Indian fisheries and 23.04% to tribal fisheries. Both the Indian and non-Indian allocations result from a court-approved settlement of litigation in *U.S. v. Oregon* in 2001, and have been used as interim allocations in all subsequent agreements for management of fall fisheries under *U.S. v. Oregon*, including the new 2005-07 Interim Management Agreement, pending the parties' reaching agreement on a new long-term settlement.

Snake River Spring/Summer Chinook and Upper Columbia River Chinook

Non-Indian harvest rates on natural-origin Snake River Spring/Summer Chinook will vary depending on runsize as shown in Table 30, but are limited to the maximum of 2%. The allowable harvest rate accounts for all types of mortality associated with the specified fisheries, including any release mortality.

Treaty Indian harvest rates for natural-origin Snake River Spring/Summer Chinook will vary depending on runsize as shown in Table 30 for mainstem fisheries below McNary Dam between January 1 and June 15, but are limited to the maximum of 15%. The expected take of listed spring/summer Chinook in tribal tributary fisheries is zero.

Lower Columbia River Chinook Salmon

The Lower Columbia Chinook salmon ESU includes both spring and fall Chinook. Natural production of spring Chinook in the Cowlitz, Kalama or Lewis rivers is limited and likely the result of natural spawning by hatchery strays. For this opinion, the proportion of natural-origin fish in the Washington tributaries is assumed to be 3% of the runsize. Natural-origin spring Chinook do occur in the Sandy River. It is estimated that about 24% of the return to the Sandy River is from natural production (Melcher K. 2005). The 2005-2007 harvest rate on the natural-origin spring component of the ESU in non-Indian fisheries is expected to be similar to the 2002-2004 range of 0.2 to 2.0% (LeFleur 2005a, LeFleur 2005b, Table 23).

Table 29. Incidental take limits and expected incidental take (as proportion of total run size) of listed salmonids for non-Indian and treaty Indian fisheries under the 2005-07 Interim Management Agreement.

ESUs	Take Limits (%)	Treaty Indian (%)	Non-Indian (%)
Snake River Fall Chinook Salmon	31.29	11.6-23.04	5.9-8.25
Snake River Spring/Summer Chinook Salmon	5.5 - 17.0[1]	5.0-15.0	0.5-2.0
Lower Columbia River Chinook Salmon			
Spring Component	Managed For Escapement Goal	0	0.2-2.0
Tule Component (LRH stock)	49% Exploitation Rate[2]	0	7.3-12.0 (49% exploitation rate) [2]

Bright Component (LRW stock)	Managed For Escapement Goal	0	9.5-18.8 (5,700 goal)
Upper Willamette River Chinook Salmon	15.0	0	5.0-11.0
Snake River Basin Steelhead			
A-Run Component	4.0[3]	3.5-8.2	1.0-1.8
B-Run Component	17.0[4]	3.4-15.0[4]	1.5-2.0
Lower Columbia River Steelhead			
Winter component	6.0[5]	0.6-10.7[6]	0.8-6.0
Summer component	4.0[3]	3.5-8.2[7]	0.6-1.6
Upper Willamette River Steelhead	6.0[4]	0	0.8-6.0[2]
Middle Columbia River Steelhead			
Winter component	6.0[5]	0.6-10.7	0.8-6.0
Summer component	4.0[3]	3.5-8.2	1.0-1.8
Upper Columbia River Spring Chinook Salmon	5.5 - 17.0[1]	5.0-15.0	0.5-2.0
Columbia River Chum Salmon	5.0	0	1.6
Upper Columbia River Steelhead			
Natural-origin Component	4.0[4]	3.5-8.2	1.0-1.8
Hatchery Component		3.5-8.2	8.6-15.0
Snake River Sockeye Salmon	6.0-8.0[8]	2.8-7.0	0.0-1.0
Lower Columbia Coho Salmon	6.5[9]	0	0-6.5[9]

[1] Allowable take depends on run size (see LeFleur 2005a, LeFleur 2005b, Table 24).
[2] Total exploitation rate limit including ocean and inriver fisheries.
[3] Applies to non-Indian fisheries only. 2% in winter/spring/summer seasons and 2% in fall season.
[4] For fall fisheries only.
[5] Applies to non-Indian fisheries only. Expected incidental take of winter steelhead is unspecified for 2006-2007.
[6] Expected impact for above Bonneville portion of ESU only. Impacts on entire ESU will be lower.
[7] Expected impact for above Bonneville portion of ESU only. Impacts on entire ESU will be lower. These percentages are an over-estimation because actual impacts would only occur in Bonneville Pool portion of Zone 6 instead of all three Zone 6 pools.
[8] Allowable take depends on run size (see LeFleur 2005a, LeFleur 2005b, Table 29).
[9] Expected in 2005 based on run size forecast. Applies to 2005 fisheries only.

Table 30. Harvest rate schedule for Chinook From January 1- June 15

Total Upriver Spring and Snake River Summer Chinook Run Size	Snake River Natural Spring/Summer Chinook Run Size[1]	Treaty Zone 6 Total Harvest Rate [2,5]	Non-Indian Natural Harvest Rate [3]	Total Natural Harvest Rate[4]	Non-Indian Natural Limited Harvest Rate[4]
<27,000	<2,700	5.0%	<0.5%	<5.5%	0.5%
27,000	2,700	5.0%	0.5%	5.5%	0.5%
33,000	3,300	5.0%	1.0%	6.0%	0.5%
44,000	4,400	6.0%	1.0%	7.0%	0.5%
55,000	5,500	7.0%	1.5%	8.5%	1.0%
82,000	8,200	7.0%	2.0%	9.0%	1.5%

109,000	10,900	8.0%	2.0%	10.0%
141,000	14,100	9.0%	2.0%	11.0%
217,000	21,700	10.0%	2.0%	12.0%
271,000	27,100	11.0%	2.0%	13.0%
326,000	32,600	12.0%	2.0%	14.0%
380,000	38,000	13.0%	2.0%	15.0%
434,000	43,400	14.0%	2.0%	16.0%
488,000	48,800	15.0%	2.0%	17.0%

[1] If the Snake River natural spring/summer forecast is less than 10% of the total upriver run size, the allowable mortality rate will be based on the Snake River natural spring/summer Chinook run size. In the event the total forecast is less than 27,000 or the Snake River natural spring/summer forecast is less than 2,700, Oregon and Washington would keep their mortality rate below 0.5% and attempt to keep actual mortalities as close to zero as possible while maintaining minimal fisheries targeting other harvestable runs.

[2] Treaty Fisheries include: Zone 6 Ceremonial, subsistence, and commercial fisheries from January 1-June 15. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.

[3] Non-Indian Fisheries include: Commercial and recreational fisheries in Zones 1-5 and mainstem recreational fisheries from Bonneville Dam upstream to the Hwy 395 Bridge in the Tri-Cities and commercial and recreation SAFE (Selective Areas Fisheries Evaluation) fisheries from January 1-June 15; Wanapum tribal fisheries, and Snake River mainstem recreational fisheries upstream to the Washington-Idaho border from April through June. Harvest impacts in the Bonneville Pool tributary fisheries may be included if TAC analysis shows the impacts have increased from the background levels.

[4] If the Upper Columbia River natural spring Chinook forecast is less than 1,000, then the total allowable mortality for treaty and non-Indian fisheries combined would be restricted to 9% or less. Whenever Upper Columbia River natural fish restrict the total allowable mortality rate to 9% or less, then non-Indian fisheries would transfer 0.5% harvest rate to treaty fisheries. In no event would non-Indian fisheries go below 0.5% harvest rate.

[5] The Treaty Tribes and the States of Oregon and Washington may agree to a fishery for the Treaty Tribes below Bonneville Dam not to exceed the harvest rates provided for in this Agreement.

The fall Chinook part of the ESU includes tule and bright subcomponents. Because the tule sub-component of the ESU is primarily hatchery-origin fish (Lower River Hatchery - LRH), and both hatchery and natural tule sub-components have similar life histories, ocean and in-river fishery impacts to naturally spawning tules can be estimated using the LRH sub-component as a surrogate. Additionally, NMFS has developed a combined ocean/freshwater Rebuilding Exploitation Rate (RER) of 49% based on the Coweeman tule population. Fisheries will be managed for the 49% exploitation rate in combined ocean and freshwater fisheries. The distribution of harvest between ocean and inriver fisheries will vary from year-to-year, but the inriver harvest rate is expected to range from 7.3 to 12.0%.

Impacts to the Lower Columbia River wild (LRW) Chinook stocks can be estimated based on tag data for North Fork Lewis River population. North Fork Lewis River fish (the largest component) have been marked with coded wire tags since 1976 thus harvest can be estimated in Columbia River and ocean fisheries based on expanded recoveries of these tags. Non-Indian fisheries below Bonneville Dam are managed to achieve the 5,700 fish escapement goal for the

North Fork Lewis River. The harvest rates for 2005-2007 non-Indian mainstem Columbia River fisheries will vary from year-to-year, but are expected to range between 9.5-18.8%.

Treaty Indian fall season fisheries impact a very small number of LRH Chinook salmon. There are no records of LRW stock fish caught in tribal fisheries, so no impact are expected.

Upper Willamette River Spring Chinook

Natural-origin spring Chinook are expected to comprise about 10-12% of the total Willamette River spring Chinook return in 2005-2007. The return of natural-origin spring Chinook to the upper Willamette and Clackamas rivers is expected to be 11,700 fish in 2005. Total non-Indian fishery impacts on natural-origin Willamette spring Chinook in the mainstem Columbia River and Willamette River combined are subject to a 15% harvest rate limit (LeFleur 2005a, LeFleur 2005b, Table 23), consistent with the fishery management plan submitted to the NMFS by ODFW titled "Fisheries Management and Evaluation Plan, Upper Willamette Spring Chinook in Freshwater Fisheries of the Willamette Basin and Lower Columbia River Mainstem" (ODFW 2001). Total impacts by non-Indian Columbia and Willamette River fisheries on natural-origin spring Chinook are expected to range from 5-11% over the course of the 2005-2007 Agreement.

Chum Salmon

The 1999-2003 non-Indian commercial landings average 58 fish. Impacts in the recreational fishery are from non-retention mortalities and are expected to be zero fish in 2005-2007 (LeFleur 2005a, LeFleur 2005b). The total impact rate on Columbia River chum is expected to average 1.6% (LeFleur 2005a, LeFleur 2005b, Table 23), but are limited to a harvest rate of not more than 5.0%.

There are no records of tribal harvest of chum in tribal fisheries. No impacts to listed chum, are expected in treaty Indian fisheries in 2005-2007.

Coho Salmon

There are two remaining populations in the Lower Columbia River coho salmon ESU with appreciable natural production, in the Clackamas and Sandy rivers in Oregon. These include both early and late timing populations that were characteristic of the ESU. In both cases, escapement information is enumerated through dam counts which provide long time series of abundance data (Table 16). For these reasons, the Sandy and Clackamas populations are used as indicators for assessing harvest impacts.

The state of Oregon listed Lower Columbia River coho as endangered under the state ESA in July of 1999. Since that time, ocean and Columbia River fisheries have been managed conservatively to protect Lower Columbia River coho, primarily those fish returning to the Clackamas and Sandy Rivers in Oregon. ODFW has developed a management plan (Melcher 2005), which includes a matrix that is based on marine survival and parent spawner status to determine annual ocean and in-river exploitation rates for natural-origin coho. The harvest management section of the plan is designed to manage impacts associated with ocean and

Columbia River fisheries that are consistent with conservation and recovery. This matrix has been used for management of ocean and Columbia River fisheries since 2002. Implementation of that plan in 2005 would allow for a combined ocean and inriver exploitation rate of 21.4%. This includes a maximum allowable harvest rate of 15 percent in ocean fisheries and 7.5 percent in Columbia River fisheries. The states adopted fisheries that are expected to result in a 10.0 percent exploitation rate in the ocean and a maximum of 6.5 percent in the river. State managers will continue to utilize large block closures, expanded river mouth sanctuaries, mesh size restrictions, and selective fisheries to minimize the impacts to Lower Columbia River coho. Since Lower Columbia River coho include both early and late stock components in the Clackamas and Sandy rivers, there is comparable protection for those run components (early and late natural-origin coho) returning to Washington tributaries. Current modeling suggests a harvest rate for inriver fisheries in 2005 of 5.4%, which would include a 6.2% harvest rate on the early stock component and 0.7% on the late stock component. If the late coho run size is greater than predicted, and more commercial fishing occurs in October, it is expected that the harvest rate will likely not exceed an overall harvest rate of 6.5%, which would include a 7.3% harvest rate on the early component and a 0.9% harvest rate on the late component.

Harvest impacts to natural origin Lower Columbia River coho in the treaty Indian fisheries are expected to be near zero. All Tribal harvest occurs above Bonneville Dam. Only three of the 21 remaining populations in the Lower Columbia River ESU are located above Bonneville Dam. A fourth population located above Bonneville Dam in the White Salmon River was extirpated because of the blockage by Condit Dam on the lower river. There may be some natural production in the other population areas, but it is presumed to result largely from stray hatchery fish. Tribal fisheries for coho are also limited. The tribes do not target coho in the mainstem. Fisheries directed at Chinook salmon are generally over by late September prior to peak passage of coho at Bonneville. The catch of coho in the tribes' mainstem fishery has ranged from 500 - 6,300 since 1999 representing an average of 3.5% of the run past Bonneville Dam (LeFleur 2004). The only proposed tributary fishery within the boundary of the Lower Columbia River coho salmon ESU is in Drano Lake at the mouth of the White Salmon River which also would have little impact on natural origin fish. There are two hatchery programs located above Bonneville that are proposed to be included in the ESU. The tribal fishery will affect a representative fraction of returning hatchery fish, and will presumably have a similar effect on any natural-origin production that may occur from the three Lower Columbia River coho populations located above Bonneville Dam. However, the resulting harvest rate on the Lower Columbia River coho ESU as a whole will be zero.

<u>Snake River Sockeye Salmon</u>

The Non-Indian fisheries will be managed according to the harvest rate schedule shown in Table 31. Non-Indian Snake River sockeye fishery impacts will be minimized to the degree possible. Non-Indian fisheries may be managed for the release of adipose fin clipped sockeye. Since all listed Snake River sockeye are adipose fin clipped, listed fish would be subject only to release mortality in non-Indian fisheries. Small numbers of sockeye are handled during the steelhead sport fishery and the commercial shad fishery. The harvest rates identified assume that Snake

River sockeye harvest rates are equal to the aggregate sockeye harvest rates. The treaty fisheries will be managed according to the harvest rate schedule shown in Table 31.

Table 31. Sockeye Harvest Rate Schedule

Upriver Sockeye Run Size	Non-Indian Harvest Rate	Treaty Harvest Rate
<50,000	1% (on listed sockeye)	5%
50,000-75,000	1% (on listed sockeye)	7%
>75,000	1% (on listed sockeye) with further discussion	7% with further discussion

<u>Steelhead</u>

<u>Lower Columbia River, Middle Columbia River and Upper Willamette River steelhead</u>
The Lower Columbia River and Middle Columbia River steelhead ESUs include both winter and summer-run populations. Because of their timing, most of the impacts on summer-run steelhead populations occur during fall season fisheries. Winter-run steelhead returning to the Lower Columbia River, Middle Columbia River, and Upper Willamette steelhead ESUs are affected by the proposed non-Indian winter and spring season fisheries.

The states proposed to manage their fisheries subject to a 2% harvest rate limit for all natural-origin summer-run steelhead during winter, spring, and summer season fisheries, and 2% harvest rate limit for summer-run steelhead during fall season fisheries. The proposed harvest rate limit for winter populations of the Lower Columbia and Middle Columbia River, and Upper Willamette River steelhead ESUs in 2005 is 6%. However, as discussed in the Consultation History section above, the states of Washington and Oregon need to clarify how they propose to manage winter steelhead impacts in 2006 and 2007. The 2005 supplemental biological opinion (NMFS 2005) provides the necessary take exemptions for the 2005 fishery until it is superseded by this biological opinion on the 2005-07 Interim Agreement. However, the states will have to reinitiate consultation regarding the effects on winter steelhead prior to the 2006 season.

The expected harvest rates associated the states' proposed fisheries for 2005-07 are less than the proposed 2% cap for winter, spring, and summer season fisheries, and 2% for the fall season fisheries (i.e. 4% total for summer-run steelhead for the year). Harvest rates vary slightly by ESU. The proposed harvest rate cap for the winter component of the listed Lower Columbia River, Middle Columbia River, and Upper Willamette River steelhead ESUs in non-Indian fisheries in 2005 is 6%. Fisheries were actually managed for a 2% harvest rate limit. Actual harvest rates were less than 2%. The expected harvest rate for the summer component of the listed Lower Columbia River and Middle Columbia River steelhead ESUs in non-Indian fisheries in 2005-2007 ranges from 0.6-1.6% and 1.0-1.8% for Lower Columbia River and Middle Columbia River steelhead ESUs, respectively (Table 26).

Tribal winter season fisheries occur during the winter counting period (from late February to no later than March 21) at Bonneville Dam and target sturgeon. Historic treaty harvest of steelhead, including estimates of natural-origin fish harvest are shown in Table 30 of the Biological Assessment (LeFleur 2005a, LeFleur 2005b), which, with one exception, has amounted since 1996 to a few tens of fish per year. It is not possible to estimate catch by ESU. The tribes assume that much if not most of the harvest in the Bonneville Pool during the winter season is winter steelhead. There are likely some holdover summer steelhead present in Zone 6 at this time also. All of the catch above the Dalles Dam would be holdover summer steelhead from the previous year. However, because of winter season count limitations at Bonneville and video counts that do not include estimates of non-ad-clipped fish, it is difficult to accurately estimate a natural-origin winter steelhead run size at Bonneville or an associated harvest rate. The tribes anticipate that within the time period covered by this agreement, the target fish in the winter fishery will continue to be sturgeon. The tribes expect catch of natural-origin steelhead in the winter season to remain within the range of that observed over the past five years (1-233 fish).

The expected harvest rate for the winter components of the Lower Columbia River and Middle Columbia River steelhead ESUs in treaty Indian fisheries in 2005-2007 is 0.6-10.7% of the natural-origin winter-run size at Bonneville (this is likely an overestimate since estimates of runsize at Bonneville are not fully accounted for), and 0% for Willamette River steelhead ESU. The expected harvest rate for the summer-run components of the Lower Columbia River and Middle Columbia River steelhead ESUs in treaty Indian fisheries in 2005-2005 is 3.5-8.2% of the natural-origin summer run size at Bonneville, and 0% for Upper Willamette River steelhead ESU (Table 26).

Tribal fisheries during the spring season (March 21-June 15) occur during a transition period at the beginning of the summer steelhead run, but during a time when some winter steelhead are probably still present in the Bonneville Pool. Historic spring season steelhead treaty Indian catches are shown in Table 31 of the Biological Assessment (LeFleur 2005a, LeFleur 2005b). This data set (through 2004) was developed ending on May 31. There would be little change in this data set by including steelhead harvest in the June 1-15 time period. It is not known what portion of the Bonneville Pool catch may be winter or summer steelhead. If it assumed that all of the spring season catch is fresh (recently arrived) summer A-run steelhead (which overestimates the summer impacts and under estimates the winter impacts), then harvest rates may be calculated on the total natural-origin summer A-run size at Bonneville (LeFleur 2005a, LeFleur 2005b, Table 31). The tribes assume that during the time period covered by this agreement, that spring season fisheries will be structured similarly to the past four years. The tribes expect steelhead harvest to remain at similar levels to the past five years with natural-origin harvest rates on the total Skamania wild and Wild A Index run sizes remaining at less than 1% with a likely harvest rate of 0.1%.

<u>Snake River and Upper Columbia River Steelhead.</u>
The states propose to manage non-Indian fisheries subject to a 2% harvest rate limit on natural-origin summer-run steelhead in the winter, spring, and summer season fisheries, and also a 2%

harvest rate in fall season fisheries. These harvest rates limits apply generally to both A-run and B-run Steelhead Index Groups. (LeFleur 2005a, LeFleur 2005b, *U.S. v Oregon* Parties 2005). The expected incidental harvest rates ranges on natural-origin Snake River A and B-run steelhead associated with the proposed non-Indian Fisheries in 2005-2007 are 1.0-1.8% and 1.5-2.0%, respectively (Table 26). The expected harvest rate range in non-Indian fisheries on Upper Columbia River steelhead is 1.0-1.8% and 8.6-15.0% for the listed natural-origin and hatchery-origin fish, respectively (Table 26).

There are no specific harvest rate constraints on tribal fisheries during the spring or summer seasons, which extend through July 31. Tables 31 and 32 tabulate the catch of steelhead and estimated harvest rate of natural-origin fish during these periods. The harvest rate in recent years has averaged less than 2% and it is expected to be similar during the course of this Agreement. Treaty Indian fall season fisheries begin on August 1 and are subject to a 15% harvest rate limit on B-run steelhead. The expected incidental harvest rates ranges on natural-origin Snake River A and B-run steelhead associated with the proposed tribal fisheries are 3.5-8.2% and 3.4-15.0%, respectively (Table 26).

Summer steelhead returning to the Upper Columbia River steelhead ESU are all A-run fish. The expected harvest rate range in tribal fisheries on Upper Columbia River steelhead is 3.5-8.2% for both, the listed natural-origin and hatchery-origin fish (Table 26).

Bull Trout

Non-Indian recreational fisheries in the Columbia River do not target Bull trout and they are rarely encountered. Commercial fisheries do not impact bull trout, which are too small to be taken in gillnets. Handle and mortality are expected to be zero for fisheries in 2005-2007.

There are no records of tribal harvest of bull trout in any mainstem fishery. No impacts to listed bull trout are expected in mainstem fisheries in 2005-2007. There are also no records of tribal harvest of bull trout in tributary fisheries. While bull trout may be present in some tributaries where tribal fishing occurs, many tributary fisheries occur relatively low in the system (Sherars Falls on the Deschutes, Castille Falls on the Klickitat). Bull trout may rarely be present at these locations when tribal fishing is occurring. However, primary gear types in tributary fisheries (hook and line and dip net) would allow for the release of any bull trout caught incidentally with a low release mortality rate. The tribes assume there will be no mortality to bull trout in any tributary fishery in 2005-2007.

4.0 CUMULATIVE EFFECTS

Cumulative effects are those effects of future tribal, state, local or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. For the purpose of this analysis, the action area is that part of the Columbia River basin described in section 1.2 above. Future Federal actions, including the ongoing operation of hydropower systems, hatcheries, fisheries, and land management activities will be reviewed through separate section 7 consultation processes. Non-Federal actions that require authorization under section 10 of the ESA, and that are not included within the scope of this consultation, will be evaluated in separate section 7 consultations.

Future tribal, state and local government actions will likely to be in the form of legislation, administrative rules, or policy initiatives, and land use and other types of permits. Government and private actions may include changes in land and water uses, including ownership and intensity, any of which could impact listed species or their habitat. Government actions are subject to political, legislative and fiscal uncertainties. These realities, added to geographic scope of the action area which encompasses numerous government entities exercising various authorities and the many private landholdings, make any analysis of cumulative effects difficult and, frankly, speculative. The recent FCRPS opinion (NMFS 2004c) does provide a more substantive discussion of available information related to cumulative effects by ESU and sub-basin, but the related conclusions continue to be largely qualitative.

Non-Federal actions on listed species are likely to continue affecting listed species. The cumulative effects in the action area are difficult to analyze considering the geographic landscape of this biological opinion, and the political variation in the action area, the uncertainties associated with government and private actions, and the changing economies of the region. Whether these effects will increase or decrease is a matter of speculation; however, based on the trends identified in this section, the adverse cumulative effects are likely to increase. Although state, tribal and local governments have developed plans and initiatives to benefit listed fish, they must be applied and sustained in a comprehensive way before NMFS can consider them “reasonably foreseeable” in its analysis of cumulative effects.

5.0 INTEGRATION AND SYNTHESIS OF EFFECTS

The 2005-2007 *U.S. v. Oregon* Interim Management Plan is a all-seasons plan that is, to a large extent, the integration of the 2001-05 *U.S. v. Oregon* Interim Management Plan for winter, spring and summer season fisheries and the 2004 Agreement for fall season fisheries. Because some ESUs are affected by fisheries previously covered by two separate biological opinions, each with its own limits for the allowable incidental take, it is appropriate to consider what is now the combined effect on such ESUs, now considered in a single biological opinion.

The 2005-2007 *U.S. v. Oregon* Interim Management Plan provides increased opportunity for both state and tribal fisheries to harvest unlisted upper Columbia River summer Chinook, while maintaining previously agreed upon harvest rate caps for all listed ESUs. This increased opportunity to harvest upper Columbia River summer Chinook is possible because 96% of the summer component of the Snake River spring/summer Chinook is now believed to pass Bonneville Dam by June 15, which corresponds to the end date for the revised spring management period for upriver spring Chinook, including the Upper Columbia River Chinook and Snake River spring/summer Chinook salmon ESUs. Otherwise the primary focus of spring management period fisheries is to access abundant non-listed hatchery stocks. Non-Indian fisheries seek to maximize their opportunity by relying, to a large degree, on mark-selective fisheries. Tribal fisheries are managed subject to harvest rate caps which vary depending on the abundance of the overall run.

During the new summer management period under the 2005-2007 *U.S. v. Oregon* Interim Management Plan (June 16-July 31), both state and tribal fisheries may target non-listed upper Columbia River Chinook. Incidental take limits for Snake River sockeye have not changed from prior agreements, but depending on abundance, may still allow some limited harvest opportunity in the non-Indian and treaty Indian summer season fisheries.

Fall season fisheries are managed in both state and tribal fisheries to target unlisted natural-origin fall Chinook and unlisted hatchery fall Chinook. This is done by limiting the total harvest rate on the upriver bright component which includes the listed Snake River fall Chinook. Additionally, non-Indian fisheries target hatchery coho through the use of selective sport fisheries and total harvest rate caps in commercial fisheries. Tribal fisheries have not targeted coho in mainstem fisheries in recent years, but incidentally harvest coho which are presumed to be primarily hatchery-origin fish and supplementation fish from upstream of the Lower Columbia River ESU. Non-Indian fisheries target unlisted hatchery steelhead throughout the year using selective fisheries. Non-Indian commercial fisheries are prohibited from retaining any steelhead. Tribal fisheries in recent years have not targeted steelhead in mainstem fisheries, but harvest steelhead incidentally while accessing unlisted Chinook and or sockeye. Incidental steelhead impacts in tribal fisheries are currently limited by the various Chinook and/or sockeye harvest limits in place, as well as a 15% harvest rate limit on the natural-origin B-Index component in fall season fisheries.

5.1 Upper Columbia River Spring Chinook and Snake River Spring/Summer Chinook

The effects of fisheries have been considered through a series of consultations since Snake River spring/summer Chinook were listed in 1992. Other listings followed, including Upper Columbia River spring Chinook, and the effects of fisheries on these species were incorporated into subsequent opinions. The sequence of past consultations contributed to the evolution of the management framework contained in the 2005-2007 Interim Management Agreement considered in this opinion and it is therefore relevant to the conclusion. The consultation history is therefore reviewed in some detail.

The Upper Columbia River spring Chinook and Snake River spring/summer Chinook salmon ESUs are not affected by fall season fisheries. The CRFMP provided a framework for managing the mainstem fisheries that impact upriver spring and summer Chinook stocks. The purpose of the CRFMP was to define harvest limits that would be sufficiently protective to allow for rebuilding of the stocks of concern. The CRFMP was formally approved in 1988, but fisheries were managed subject to its provisions beginning in 1986.

For reference purposes, the CRFMP allowed for harvest rates up to 4.1% on upriver spring stocks in non-Indian fisheries and either 5% (for aggregate runs less than 50,000) or 7% (for runs between 50,000 and 128,800) in treaty Indian ceremonial and subsistence (C&S) fisheries. (128,800 is 112% of the 115,000 interim management goal as measured at Bonneville Dam.) For runs greater than 128,800, half the surplus greater than 128,800 was considered harvestable in mainstem fisheries. The CRFMP also provided that all fish in excess of 143,750 were harvestable. The CRFMP set an interim management goal of 25,000 natural-origin spring Chinook as measured at Lower Granite Dam. Although the CRFMP specified that the interim goal was limited to the purpose of managing fisheries in the Snake Basin and therefore would not affect mainstem harvest rates, it nonetheless provides useful perspective about the parties' views of desired condition for the natural-origin stocks at the time the CRFMP was developed.

In 1992, when the Snake River spring/summer Chinook salmon ESU was listed, new constraints were implemented. These were refined through a series of annual consultations that led to the development in 1996 of a three year Management Agreement that modified the CRFMP's original harvest management framework (*U.S. v. Oregon* 1996, Table 15)[5]. The Plan's provisions were modified by reducing allowable impacts in the non-Indian fisheries. The alternative target harvest rates in the treaty Indian fisheries (5%-7%) were not changed as a result of the Agreement, but the Agreement did, for the first time, require that fisheries be managed in response to the status of listed natural-origin fish rather than an aggregate runsize that was now composed primarily of hatchery-origin fish. The 1996 Agreement provided that harvest rates would match those of the original CRFMP only if the anticipated return of natural-origin spring Chinook from the Snake River exceeded 10,000 fish. The 10,000 fish bench mark was designed to approximate the run necessary to meet the BRWG threshold escapement levels (NMFS 2001a, Table 15). The Agreement left unresolved what would happen if the aggregate return was greater than 115,000 <u>and</u> the return of natural-origin Snake River spring Chinook was greater than 10,000. There were no similar bench marks developed for Upper Columbia River Chinook ESU because they were not listed in late 1995 when the Agreement was being developed.

The CRFMP limited harvest rates on upriver summer Chinook stocks in the non-Indian and treaty Indian fisheries to 5% each. The three-year Agreement reduced the harvest rate limit for upriver summer Chinook in the non-Indian fishery from 5% to 1% and clarified that all treaty Indian fisheries were subject to the 5% harvest rate limit. At the time, the purpose of these further constraints was to limit the potential take of the summer component of the Snake River spring/summer Chinook salmon ESU. These limits on summer Chinook harvest were not particularly confining since both the states and tribes had been managing their fisheries well below these limits because of low returns and conservation concerns.

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[5]The 1996-1998 Agreement was subsequently extended through July 31, 1999.

Provisions of the CRFMP and associated 1996 Management Agreement were considered in detail through an intensive consultation process and in the associated biological opinion that was completed in 1996 (NMFS 1996a). During its analysis of the Management Agreement, NMFS sought, among other things, to assess whether the Agreement was consistent with principles articulated in its Proposed Recovery Plan for Snake River Salmon (PRP) (NMFS 1995a). The proposed plan was published in April 1995 and so was pertinent to the consideration of the three year Agreement. Although the PRP was never finalized, the principles articulated there were still valid.

The PRP recognized that the harvest rates affecting spring and summer Chinook stocks had already been greatly reduced, leaving relatively little opportunity to aid recovery through further reductions. Notwithstanding the conservation actions taken up to that point, NMFS concluded that the status of the listed species was such that harvest had to be reduced and maintained at low levels until actions to improve other life stages took effect. It was apparent then that critical threshold escapement levels for spring/summer Chinook salmon that had recently been identified by the BRWG (1994, Table 4) would not be met in the near term, even in the absence of all harvest. As a result, a primary objective articulated in the PRP was to define minimized fishery levels that would be necessary for the foreseeable future, recognizing that expanded harvest needed to be tied to the status of the listed species. Minimized fisheries were defined as harvest levels necessary for conservation when even minimum biological objectives cannot be met. At the time, minimized fisheries were recommended that prioritized, to the degree possible and consistent with the conservation needs of the species, C&S opportunity for tribal fisheries and <u>limited</u> impacts that occur incidental to fisheries directed at other species or stocks. (We note briefly here, and in more detail later, that these same principles were reiterated and affirmed in the Federal Caucus' Final Basinwide Salmon Recovery Strategy (Federal Caucus 2000) generally referred to as the All-H paper, which was a companion document to the 2000 FCRPS Biological Opinion (NMFS 2000d))

The conclusion in the 1996 opinion was that the 1996-1998 Management Agreement was consistent with the principles outlined in the PRP. Despite successive reductions made in past years that were recognized in the opinion, the Agreement reduced harvest further to what NMFS accepted as minimum levels. These were considered consistent with the conservation needs of the species while providing for tribal C&S opportunity that had been defined by the tribes themselves during development of the CRFMP as an appropriate response to a significant conservation need. The minimized fishery levels also included extremely limited impacts that occurred incidental to state fisheries directed at other species or stocks. The Management Agreement augmented the CRFMP in that it established management objectives that were tied directly to the status of the listed species. NMFS considered this a necessary and fundamental change from the CRFMP, which generally managed based on aggregate runsize rather than the status of natural-origin stocks. This is particularly important when the natural-origin stocks of concern comprise on average about 13% of an aggregate run that is composed primarily of hatchery-origin fish. NMFS concluded that the low harvest rates allowed under the 1996

Agreement provided substantial protection for the listed species, and would be necessary until improvements affecting other life stages took effect.

The 1996-1998 Management Agreement was extended through July 31, 1999 and therefore applied to the 1999 spring fisheries as well. By the time the 2000 season approached, additional listings had occurred, including the Upper Columbia River spring Chinook ESU, which is listed as endangered under the ESA. In 2000, there was a preseason forecast for upriver spring Chinook of 134,000 that was higher than it had been for some time. Based on the higher aggregate run size, the tribes proposed a harvest rate for spring Chinook of 9% while the states proposed a harvest rate ranging from 1-2%. Despite intensive negotiation that ensued through the consultation period and for reasons articulated in the biological opinion (NMFS 2000a), NMFS concluded that an increase in the harvest rate beyond 9%, no matter how small, was inappropriate given the status of the stock. NMFS issued a jeopardy opinion and limited the overall harvest rate to 9%.

Importantly, the All-H paper in 2000 also provided a broader context for consideration of harvest-related mortality that affirmed and amplified the themes articulated in the original PRP. The paper affirmed that conservative management policies were essential for an interim period while survival improvements are made in other sectors, but recognized that at some point further reductions in harvest were unlikely, by themselves, to result in recovery. The All-H paper also recognized and articulated: 1) the need to balance the conservation of at-risk species with the Federal government's trust obligations to Indians, 2) the priority of tribal fishing rights, particularly with respect to non-Indian fisheries, 3) a willingness to accept a level of risk associated with tribal fishing greater than the biology might strictly imply, and 4) the idea that there is an "irreducible core" of tribal harvest that is so vital to the treaty obligation that the federal government will not eliminate it (an elaboration of the minimized fisheries concept from the PRP). The All-H paper took all of these factors into consideration when it established the 9% harvest rate cap for fisheries affecting Snake River and Upper Columbia River spring Chinook. The 9% cap was then carried forward in subsequent analyses related to the 2000 FCRPS biological opinion and thus became one of the underlying assumptions related to its conclusions. This then provided the bench mark against which subsequent harvest proposals had to be compared.

In 2001, there was a preseason forecast for upriver spring Chinook of 364,000 that was twice what it was in 2000 and three times what it had been up to that time in prior years going back to 1979. The Parties reached an Interim Management Agreement for winter, spring, and summer fisheries that allowed for a variable harvest rate based on the aggregate upriver spring Chinook runsize and the natural-origin Snake River spring/summer Chinook runsize (Table 30). The actual runsize in 2001 was 437,910, exceeding the forecast by almost 70,000 fish.

For a detailed description leading to the development of the sliding scale harvest rate schedule for upriver spring and Snake River spring/summer Chinook, refer to NMFS' biological opinion on the 2001 Interim Management Agreement (NMFS 2001a).

In summary, the management agencies were faced with a substantial increase in abundance for upriver Chinook stocks and proposed a sliding scale harvest rate schedule based on the abundance of the aggregate upriver spring Chinook runsize and the Snake River spring/summer Chinook runsize combined. The harvest rate schedule also included a constraint related to the status of natural-origin Upper Columbia River spring Chinook. Two aspects of the 2001-2005 Interim Management Agreement were important in reaching a no jeopardy conclusion in NMFS' 2001 section 7 consultation with regards to the proposed harvest rate schedule for upriver spring Chinook: the duration of the agreement; and the introduction of lower harvest rate caps for low runsize years (NMFS 2001a). NMFS reached the conclusion that, for a five year period, it was appropriate to allow for an increased take limit in years of high abundance if the management provisions also required a decrease in the take limit in years of low abundance.

During the last five years (2000-2004), the aggregate upriver spring Chinook average runsize was 283,916 compared to the previous 10-year average of 68,500. Returns of natural-origin spring/summer Chinook to Lower Granite Dam have averaged 31,873 since 2001, compared to an interim escapement goal of 31,440. Returns of Upper Columbia River spring Chinook have increased substantially since 2001 relative to prior years, although escapements are still too often below cautionary levels (Table 4).

Because of the higher runsizes for the aggregate upriver spring Chinook and Snake River spring/summer Chinook salmon stocks in recent years, the allowable harvest rates for upriver spring Chinook in non-Indian and treaty Indian fisheries have ranged from 12% to 16%, in the upper range of the sliding harvest schedule in 2001 biological opinion (NMFS 2001a). Actual returns post-season have been close to forecasts in recent years, and TAC's ability to do timely inseason runsize updates has allowed for managing fisheries with minimal risk of exceeding impacts post-season. Since 2001, the maximum allowable take for Upper Columbia River spring Chinook or Snake River spring/summer Chinook ESUs have not been exceeded.

Through the Interim Management Agreement for 2005-2007, the Parties now proposed to continue to rely on a management framework that is very similar to that proposed in the 2001 Agreement. The proposed sliding scale harvest rate schedule in Table 30 has changed slightly from the schedule of the 2001 biological opinion (NMFS 2001a). Breakpoints in the harvest rate schedule were increased to accommodate the inclusion of the summer component of the Snake River spring/summer ESU into the revised spring management period (see section 1.2 for details). However, the effect of the change was neutral and intended to provide the same level of harvest at comparable runsizes. The harvest rate schedule will continue to provide for a modest level of increased harvest when runsizes are higher, while limiting harvest to low levels if and when runsizes decline. Apart from the modification designed to accommodate for the change in management period, the 2005-2007 Agreement proposes to extend the harvest rate schedule considered in 2001-2005 Interim Agreement. The consideration relative to the harvest rate schedule articulated in the 2001 biological opinion (NMFS 2001a) and summarized above continues to apply. The no jeopardy conclusion is further supported by the improved runsizes of Snake River spring/summer Chinook and Upper Columbia River spring Chinook salmon observed in recent years. Based on these considerations, NMFS concludes that continued reliance on the harvest rate standard used in recent years and the impacts associated with the proposed 2005-2007 fisheries are not likely to appreciably reduce the likelihood of survival and recovery of Snake River fall Chinook.

5.2 Snake River Fall Chinook

The Snake River fall Chinook salmon ESU is affected only by fall season fisheries. Snake River fall Chinook are expected to be one of the principal limiting stocks in the fall season fisheries. In recent years, these fisheries have been subject to ESA take limitations and required to reduce the harvest rate on Snake River fall Chinook by 30% relative to the 1988-93 base period. This translates into an overall inriver harvest rate of 31.29%. The states and tribes again propose to manage their fisheries for 2005-2007 within the harvest rate limit, and allocate the 31.29% harvest rate between the proposed non-Indian and tribal fisheries - 8.25% and 23.04%, respectively.

NMFS first implemented the 30% base period reduction criterion as a standard for evaluating fall season fisheries in 1996, associated with its review of the 1996-1998 Fall Season Agreement (NMFS 1996a). The 1999 fall season biological opinion (NMFS 1999d) again reviewed the history and considerations used in developing the 30% base period reduction standard. As indicated, this standard was derived largely based on then available information regarding the level of harvest rate reduction that was necessary and sufficient to avoid appreciably reducing the likelihood of survival and recovery of the species in the wild. At the time, no quantitative analyses were available that could determine the effect of harvest impacts, in combination with other mortality factors, on the likelihood of survival and recovery. It was clear, however, that the species had declined to low levels under the existing baseline conditions and that survival improvements were required across all sectors, including harvest. The 30% reduction, in combination with an analogous reduction in ocean fisheries, was considered a significant reduction to address, at least initially, the need for survival improvements in harvest given the current status of the stock and other anticipated actions. Incorporated into that consideration was a willingness to accept some increase in the risk to the species associated with higher harvest rates and fishery needs that were primarily related to the tribes' treaty fishing rights. The judgment made at the time was that the 30% base period reduction standard provided the appropriate balance without putting the species at undue risk. The standard was adopted in a biological opinion regarding the 1996-1998 Fall Season Agreement with the explicit provision that it would be reviewed and revised if necessary based on best available information (NMFS 1996d). In fact, in the 1999 biological opinion, the Paties, at NMFS insistence, removed a provision in the 1996-1998 Agreement that allowed for a higher harvest rate under certain conditions. NMFS also rejected a proposal for a higher harvest rate based on new information which purportedly demonstrated an improvement in the status of the stock. The 1999 opinion reaffirmed the 30% reduction standard which has been applied consistently to the present time.

As indicated above, considerations related to trust obligations and treaty rights were central to the development of the 30% harvest reduction standard. Since the initial listings of Pacific salmon in 1991, NMFS has sought to develop and articulate its policy on tribal treaty obligations and trust responsibilities as they related to implementation of the ESA. One result of these deliberations was a statement of policy that was included in the 1995 PRP for Snake River Salmon (NMFS 1995a). Among other things the PRP confirmed that the Federal government should be guided by what are commonly known as the Conservation Necessity Principles when implementing the ESA in a manner that would restrict exercise of treaty rights. The conservation necessity principles are standards developed through the Federal courts that articulate necessary conditions for imposing conservation restrictions on treaty reserved fishing rights. The Conservation Necessity Principles indicate that such restrictions will be not be imposed unless:

- the restrictions are reasonable and necessary for the conservation of the species at issue;
- the restrictions are necessary because the conservation purpose cannot be achieved through reasonable regulation of non-treaty activities;
- the restrictions are the least restrictive measures available to achieve the conservation purpose;
- the restrictions, either as stated or as applied, do not discriminate against treaty activities; and
- the restrictions are necessary because voluntary tribal conservation measures are not adequate to achieve the conservation purpose.

Policy commitments such as those described in the PRP provided guidance for subsequent consultations on fisheries, particularly as NMFS sought an appropriate balance between trust obligations and the imperative of meeting the conservation needs of the listed species. The guidance was incorporated in the 1996 and 1999 biological opinions (NMFS 1996a, 1999d) on fall season inriver fisheries (the 1996 opinion covered proposed fisheries from 1996 - 1998) that provided the basis for the current harvest standard. The policy commitment and guidance related to treaty rights was reiterated in other documents and correspondence, including the All-H paper (Federal Caucus 2000) and subsequent consultations on harvest.

Federal court decisions have clarified that the tribes have a treaty right is to harvest up to 50% of the harvestable surplus of fish passing through a tribes’ usual and accustom fishing areas. Harvestable surplus is defined conceptually as runsize minus the escapement goal. During fall season fisheries the tribes’ primary target is fall Chinook from the Upper Columbia River summer/fall Chinook ESU which spawn in the Hanford Reach. This ESU is not listed and in fact is healthy. The fall component of the ESU that is targeted in the fishery has exceeded its escapement goal by a wide margin in every year since 1982. For 2005-2007, as in past years, the tribes have proposed to voluntarily forego some harvest in order to reduce harvest on listed Snake River fall Chinook and other species of concern. Under the proposed fishery plan, the tribes would limit their harvest because of conservation concerns for Snake River fall Chinook and, as a result, expect to harvest only 34.7% of the harvestable surplus of Upper Columbia

River fall Chinook. Harvest opportunity on other species, particularly steelhead, would also be substantially limited.

A further consideration in evaluating the status of Snake River fall Chinook has been the existence of four artificial propagation programs producing Snake River fall Chinook. These rely on the Lyons Ferry Hatchery stock and include a substantial reservoir of fall Chinook that are part of the ESU. Although hatchery fish are not a substitute for recovery, they do provide a further safeguard against catastrophes or continuing failures of the natural system, which reduces the risk of species extinction. In this case, the Lyons Ferry Hatchery is used to maintain a brood stock, and is also used as a source for a very substantial supplementation program. The supplementation program has been scaled up over the last several years to provide both fingerling and yearling outplants that are acclimated and released in areas above LGD. The immediate objective of the supplementation program is to increase the number of natural-origin spawners. The return of adults to LGD from the supplementation program has increased from 479 in 1998 to over 8,500 in 2003. This is in addition to the adults returning from natural production (see Table 5). The total return of Snake River fall Chinook to Lower Granite Dam in 2004 was 15,582. Although the return has not yet been broken down into hatchery and natural-origin components, the 2004 return continues the trend of increased escapement.

The return of fish from the supplementation program is not a substitute for recovery which depends on the return of self-sustaining populations in the wild. However, supplementation can be used to mitigate the risk of extinction by boosting the initial abundance of spawners while other actions are taken to increase the productivity of the system to the point where the population is self sustaining and supplementation is no longer required. Collectively, artificial propagation programs in the ESU provide slight benefits to ESU abundance, spatial structure, and diversity, but have neutral or uncertain effects on ESU productivity (69 FR 33102, June 14, 2004).

In considering the proposed 2005-2007 fisheries, it is also appropriate to review the magnitude of harvest reductions and the change in spawner escapements in recent years. The average harvest rate of Snake River fall Chinook in the Columbia River since 1996 is just over 26%, which is lower than the 31.29% limit. Taken from a broader perspective we can look at the combined impact of ocean and inriver fisheries and how that has changed over the last 20 years. The exploitation rate on Snake River fall Chinook in the ocean and inriver fisheries combined has declined from an average of 67%, from 1986-1995, to 45%, since 1995, representing a 33% reduction in the overall exploitation rate. The abundance of Snake River fall Chinook has increased dramatically in recent years (Table 3). We do not currently have a forecast for the return of natural-origin Snake River fall Chinook to LGD for 2005, but the river mouth run size is expected to be similar to that observed in 2004 suggesting another strong return of Snake River fall Chinook in 2005.

Other available abundance indicators reflect a similar pattern of substantial increase in recent years. The number of redds, smolt out-migrants at Lower Granite Dam, and jacks all increased over the last four or five years (see Figures 1 to 3).

The adult returns observed in recent years can be compared to the previously identified lower abundance threshold of 300 and recovery escapement goal of 2,500 which are the kinds of benchmarks suggested in the VSP paper (McElhany et al. 2000) for evaluating populations status. NMFS has more recently reaffirmed the use of 2,500 as an interim abundance target for Snake River fall Chinook pending development of final recovery goals through the recovery planning process (Lohn 2002). Escapements prior to 2001 were well below goal, but also consistently above the lower abundance threshold. (This lower threshold is considered indicative of increased relative risk to a population in the sense that the further and longer a population is below the threshold the greater the risk; it was clearly not characterized as a "redline" below which a population must not go (BRWG 1994).) The return of natural origin fish in 2004 is not available yet, but in 2001, 2002, and 2003 approached or exceeded the recovery escapement goal of 2,500, while averaging 3,700. The forecast for 2005 is not yet available. The increase in escapement cannot be attributed directly to decreased harvest, but it does support the initial judgment that the prescribed harvest rates are consistent with expectations of rebuilding to meet survival and recovery goals.

This analysis suggests that harvest reductions and other actions taken to improve survival in recent years have contributed to the species' improved abundance. The analysis confirms the qualitative considerations that suggested that harvest reductions, along with other actions taken to reduce mortality, were consistent with expectations of survival and recovery and supports their continued use for 2005-2007. However, improved natural conditions, specifically ocean conditions, have also contributed to the species improved runsizes and it is difficult to sort out the relative contribution of human actions taken to reduce mortality and improved natural conditions in general. The recent Federal Register notice regarding proposed ESA salmon listings (69 FR 33102, June 14, 2004) emphasizes that improved natural conditions may be transitory and the need for caution against premature conclusions related to species recovery. Survival improvements achieved to date in harvest and elsewhere will remain important to long term recovery until we develop a better understanding of the factors that have contributed to the abundance increases in recent years. Based on these considerations, NMFS concludes that continued reliance on the harvest rate standard used in recent years and the impacts associated with the proposed 2005-2007 fisheries are not likely to appreciably reduce the likelihood of survival and recovery of Snake River fall Chinook.

5.3 Lower Columbia River Chinook

Because of run timing, the spring component of Lower Columbia River Chinook is not harvested in the proposed fall season fisheries. Similarly, the tule and bright fall components of the ESU are taken only in fall season fisheries. Nearly all of the tule and bright stocks of the Lower Columbia River ESU return to tributaries located below Bonneville Dam. Lower Columbia

River fall Chinook are therefore largely unaffected by fall season tribal fisheries which do not extend below Bonneville.

Incidental impacts to this ESU occur in non-Indian winter, spring, and summer, and fall season fisheries. Impacts to the ESU in the winter, spring and summer seasons are low with an expected harvest rate range of 0.2-2.0%, and limited to the spring component of the ESU. There are no additional impacts to spring stocks in the fall season fisheries.

All of the three remaining spring Chinook stocks in the Lower Columbia River Chinook ESU are supported by associated hatchery programs since dams block passage to most, if not all, of their historic spawning and rearing habitat. Given the circumstances, NMFS concluded in an earlier consultation that it is appropriate that harvest be managed to ensure that hatchery escapement goals are met, thus protecting what remains of the genetic legacy of the ESU until such time that future planning efforts can lay out a more comprehensive solution leading to recovery (NMFS 2001b). The proposed fisheries will not limit the ability of the spring-timed stocks to meet hatchery escapement goals. The hatchery escapement goals have been met in recent years. Ocean fishery impacts have been reduced in recent years as a result of the Pacific Salmon Treaty (PST) agreement (NMFS 1999e). Terminal area tributary fisheries that might target unlisted surplus hatchery fish are not included as part of the state’s proposed fisheries, but are managed specifically to meet hatchery escapement goals. These tributary fisheries are exempt from the ESA take prohibition under an applicable 4(d) Rule (July 10, 2000, 65 FR 42422). Continued reliance on hatchery-origin fish for the survival of an important component of the Lower Columbia River Chinook ESU is not a satisfactory long-term solution. However, given the circumstances, the limited impacts that will occur pursuant to the proposed fisheries will have no detrimental effect on the species’ prospects for survival and recovery.

The tule and bright stocks have fall return timing. Tule stocks have been managed since 2002 subject to a total exploitation rate limit on the Coweeman fall Chinook of 49% for a ll ocean and inriver fisheries. This Rebuilding Exploitation Rate (RER) is derived using biological-based criteria that are tied to the regulation definition of the phrase, “... jeopardize th econtinued existence ...” from Endangered Species Act. The derivation of the RER and associated rationale is discusses in more detail in the 2004 Biological Opinion for Pacific Fisheries Management Council (PFMC) fisheries (NMFS 2004d).

Lower Columbia River tule stocks have been subject to habitat degradation due to of factors related to resource exploitation and land use development. Hatchery programs have been pervasive throughout the Lower Columbia River, in particular, for over a hundred years. As a result, only two self-sustaining stocks of tule Chinook in the lower Columbia River have been identified that are not substantially influenced by hatchery strays. Escapement in the East Fork Lewis River has been relatively stable. Escapement to the Coweeman has averaged over 870 in recent years. Both populations have experienced significant increases in escapement since 2001.

There is no shortage of hatchery fish, including many that are part of the ESU (although not presently listed), that may be used for recovery efforts. Harvest mortality on tule stocks has been reduced substantially in recent years. Given the circumstances, it is unlikely that the anticipated harvest from inriver fisheries pose a significant risk to the tule component. In this case, the broader objective of the ESA, which requires survival and recovery of self-sustaining, naturally spawning populations, can best be achieved through focused recovery planning efforts that identify habitats that can be rehabilitated, coupled with harvest management programs that provide the necessary protections that will allow for rebuilding. Until then harvest of tule stocks needs to be constrained to sufficiently protect the few remaining naturally spawning populations. The fact that these populations have been relatively stable and that overall harvest mortality has declined in recent years suggests that the proposed fisheries do not pose a substantial risk to those populations, nor limit the potential for longer-term recovery efforts. The estimated RER for the Coweeman stock is 49 percent. Ocean and inriver fisheries will continue to be managed to ensure that all fishing-related mortality is consistent with this objective.

The Lower Columbia River bright component is one of the few healthy wild stocks in the Columbia River Basin. The Lewis River bright stock has consistently exceeded its escapement goal of 5,700 by a substantial margin. Given the relative health of this stock and the pattern of reduced mortality, NMFS does not believe that the proposed fisheries pose a substantial risk to the Lower Columbia River bright populations.

NMFS has considered status and stock structure, as currently defined, of each life history component of the ESU and impacts from the proposed fisheries on each. Based on the above considerations, NMFS concludes that the proposed fisheries managed subject to the proposed Agreement are not likely to jeopardize the continued existence of the Lower Columbia River Chinook ESU.

5.4 Upper Willamette Chinook

Prior to the 2001 spring season, ODFW submitted a Fish Management and Evaluation Plan (FMEP). The FMEP was a long term management plan that was proposed to be implemented indefinitely. NMFS approved the FMEP on February 9, 2001 (NMFS 2001c). Provisions of the FMEP are fully incorporated into the 2005-2007 Interim management Agreement. The anticipated harvest rate on Upper Willamette River spring Chinook in the proposed state mainstem Columbia River fisheries in 2005-2007 ranges from 5-11%, and not to exceed a overall combined harvest rate of 15% from all freshwater fisheries combined.

NMFS concluded previously that managing Upper Willamette River spring Chinook according to the provisions of the FMEP is not likely to jeopardize the continued existence of the ESU (NMFS 2001c) and here reaffirms that determination.

5.5 Chum Salmon

Chum salmon are not caught in winter, spring, and summer fisheries, or during tribal fall fisheries above Bonneville Dam. Chum are caught occasionally in non-Indian fall season fisheries below Bonneville. There are no fisheries targeted at hatchery or natural-origin chum. There are also no chum hatchery production programs in the Columbia Basin except for those designed to supplement natural production. The later fall return timing of chum is such that they are vulnerable to relatively little potential harvest in fisheries that target primarily Chinook and coho. Chum rarely take the kinds of sport gear that is used to target other species.

Harvest rates are difficult to estimate since we do not have good estimates of total run size. Spawning surveys focus on index areas and so provide estimates for only a portion of the run. However, the incidental catch of chum amounts to a few 10's of fish per year. The harvest rate in proposed state fisheries in the lower river is estimated to be 1.6% per year and is almost certainly less than 5%. Based on these considerations and other factors discussed above, NMFS concludes that the impacts associated with the proposed 2005-2007 fisheries are not likely to appreciably reduce the likelihood of survival and recovery of Columbia River chum salmon.

5.6 Lower Columbia Coho Salmon

Of the 23 populations that existed historically in the ESU (BRT 2003), only the Sandy and Clackamas River populations currently have appreciable natural production. Therefore, these two populations are used as indicators for analyzing the impacts of proposed fisheries to natural origin Lower Columbia River coho salmon. The Sandy River stock is an early-timed population. Although there is still some uncertainty on this point, the Clackamas apparently has both early and late timed components with the late population considered to represent the native run (Zhou and Chilcote 2004). The long-term abundance trends and population growth rate have been slightly positive while the short-term trends and population growth rate have been slightly negative (BRT 2003).

Until recently the exploitation rates in salmon fisheries on Lower Columbia River coho were very high, contributing to their decline, particularly because of what we now know about the effect of cycles in ocean productivity. The combined ocean and freshwater exploitation rates for Clackamas River coho regularly exceeded 90% through the early 1980s (personal communication from C. Melcher, ODFW, June 8, 2004). Present exploitation rates have declined by 77 percent on the early-run component and 86 percent on the less productive late component of the ESU when compared with those in the 1970's and 1980's (personal communication with Curt Melcher, ODFW, June 8, 2004).

Beginning in 2002, ocean and inriver fisheries have been managed using a harvest matrix approach developed by ODFW in which annual exploitation rate objectives are determined based on parental escapements and marine productivity. For Lower Columbia River coho, this document serves as a conference on the 2005 fishing season because the listing determination is pending. Although ODFW’s management plan would allow for higher exploitation rates, the states of Oregon and Washington proposed more limited fisheries for 2005. Implementation of that plan in 2005 would allow for a maximum cumulative exploitation rate of 21.4%. This includes a maximum allowable harvest rate of 15 percent in ocean fisheries and 7.5 percent in Columbia River fisheries. The states adopted fisheries for 2005 that are expected to result in a

10.0 percent exploitation rate in the ocean and a maximum of 6.5 percent in the river. However, most of the inriver fisheries are scheduled to occur prior to mid-October and prior to the ocean escapement of most late timed natural origin fish. As a result, the early and late timed natural populations would be subject to different harvest rates. No impacts on natural origin coho are expected in treaty Indian fisheries in 2005.

Recent information suggests that the management plan ought to be reviewed and possibly revised. Zhou and Chilcote (2004) analyzed the status of the early and late timed populations in the Clackamas. They concluded that the early timed component is quite productive and can sustain relatively high harvest rates with little risk of extinction, even with relatively conservative assumptions about future marine survival. Zhou and Chilcote recommended conducting an analysis of status, productivity, and the likelihood of extinction for the early timed Sandy River population, but that is not available at this time. However, escapement to the Sandy has averaged 920 over the last five years compared to a maximum sustained production escapement goal of 1,500. The spawner-to-spawner return rate has ranged from 1.6 to 6.3 and averaged 3.7 over the same period, indicating that the population has been growing in recent years coincident with improved ocean conditions. Harvest rates in 2005 are well below those that would be allowed under the management plan (10.0% v 15% for ocean fisheries and 5.4% to 6.5% v 7.5% for inriver fisheries). Total exploitation rates in 2005 on the early-run component of the Lower Columbia River Coho Salmon ESU are expected to be 14.6 percent or less. It is therefore reasonable to conclude that the proposed fisheries are not likely to result in a significant risk to early-timed populations.

In contrast, Zhou and Chilcote concluded that the late timed population is less productive and thus not able to sustain comparable harvest impacts. As a result, implementation of ODFW's current harvest rate matrix if managed up to the ceiling rates over the long term may lead to an unacceptably high risk of extinction for the population. However, proposed exploitation rates on the combined early and late aggregate are again less than would be allowed under the plan (10.0 % v 15% for ocean fisheries and 5.4 to 6.5% v 7.5% for river fisheries). Total exploitation rates in 2005 on the late-run component of the Lower Columbia River Coho Salmon ESU are expected to be 11.7 percent or less. Zhou and Chilcote estimated extinction probabilities for the late population using a range of initial conditions and assumptions. The analysis indicated that the extinction probability is near 0 if the initial population is 100 fish or more and the total harvest rate is less than 20%. Over the last six years (two brood cycles: 1999-2004) the escapement of late time coho has ranged from 54 to 1,879 and averaged 593 (Table 16). The analysis is therefore consistent with assumptions related to the initial conditions (100 fish or more) and a harvest rate of less than 20%, and suggests that the fisheries proposed in 2005-2007 are not likely to result in a significant extinction risk to the late-timed component. This is a conservative approach since there is uncertainty regarding the degree of distinction between the early and late-run components, i.e., two late spawners identified in 1999 resulted in an adult return in 2002 of 183.

A paradoxical characteristic of the Lower Columbia River Coho Salmon ESU is the relative scarcity of natural origin fish compared to the high abundance of hatchery origin fish that are considered part of the proposed ESU. The existence of these hatchery populations results in both risks and benefits to the species. The extreme loss of naturally spawning populations, the low abundance of extant populations, diminished diversity, and fragmentation and isolation of the remaining naturally produced fish confer considerable risks on the ESU. The paucity of naturally produced spawners in this ESU is contrasted by the very large number of hatchery produced adults. The abundance of coho returning to the Lower Columbia River over the last four years ranged from 460,000 to more than one million. The magnitude of hatchery production continues to pose significant genetic and ecological threats to the extant natural populations in the ESU. However, these hatchery stocks collectively represent a significant portion of the ESU's remaining genetic resources. The 21 hatchery stocks considered to be part of the ESU, if appropriately managed, may prove essential to the restoration of more widespread naturally spawning populations. At present, the Lower Columbia River coho hatchery programs reduce risks to ESU abundance and spatial structure, provide uncertain benefits to ESU productivity, and pose risks to ESU diversity. Overall, artificial propagation mitigates the immediacy of ESU extinction risk in the short-term but is of uncertain contribution in the long term (69 FR 33102, June 14, 2004). Based on these considerations, NMFS concludes that the impacts associated with the proposed fisheries in 2005 are not likely to appreciably reduce the likelihood of survival and recovery of Lower Columbia River ESU.

5.7 Snake River Sockeye

The expected combined harvest rate on Snake River sockeye salmon in the proposed fisheries is from 2.8-8.0% based on possible range of runsize projections (Table 31). The proposed state and tribal fisheries are subject to a maximum harvest rate limit of 8.0%. Non-Indian fisheries are limited to a maximum harvest rate of 1%. Tribal fisheries are managed subject to a maximum harvest rate of 5% or 7%, depending on the anticipated return of upriver sockeye runs. Fisheries managed under these same provisions since sockeye were first listed in 1991 have resulted in harvest rates substantially below those allowed. The total harvest rate over the last 5 years has averaged less than 5%.

The proposed fisheries will presumably reduce the number of returning sockeye in proportion to the expected harvest rate and thereby presumably reduce proportionally future reproduction since there will be fewer potential spawners. (The distribution of the species will not be affected by the proposed fisheries.) It is therefore necessary to consider whether these reductions reduce the species or ESU's likelihood of survival and recovery in the wild.

The survival and recovery of Snake River sockeye depends on our ability to rebuild the runs from near-extinction levels and improve overall survival to the point that they become self-sustaining. The initial effort to rebuild the run depends primarily on the success of the captive broodstock and reintroduction program. The year 2000 was the first year of substantial return from this experimental program, with a return of Snake River sockeye to terminal areas in Idaho of 257. The returns in the five years since 2000 have ranged from 3 to 26 fish and averaged 66 per year. However, these returns are still significantly above the returns in recent years (see Table 15). The broodstock program has demonstrated its ability to be self-generating and has accumulated a backlog of broodstock and juveniles that can generate a continuing stream of adult returns if the program continues to prove successful. The initial success helps establish that the captive broodstock program can be used to rebuild the run to the point that it can begin to establish a natural reproduction cycle. A necessary next step will be to evaluate whether the returning adults can spawn successfully with sufficient productivity to be self-sustaining.

The low level of harvest associated with the proposed fisheries does not affect the ability of the broodstock program to produce fish for release since the program now generally operates at capacity for producing smolts and other life stages. The proposed harvest rate is also too low to make a substantial difference in the number of returning adults. NMFS concludes that the prospects for future survival and recovery of Snake River sockeye is not appreciably reduced by the proposed fisheries. Based on these considerations, NMFS concludes that fisheries managed in 2005-2007 are not likely to jeopardize the continued existence of Snake River sockeye salmon.

5.8 Steelhead

Harvest management for steelhead in the Columbia River Basin is more complex than that for other listed ESUs. For most listed species an outcome of NMFS' section 7 consultation process is a harvest rate limit that is specific to the ESU (e.g., Snake River fall Chinook or Snake River sockeye) or even a component of the ESU (e.g., Coweeman River exploitation rate limit as a surrogate for Lower Columbia River Chinook tule stocks). Because of the complexity of steelhead biology and limitations on our ability to assess ESU specific impacts, harvest limitations on steelhead are expressed in terms of other identifiable stock groups during particular seasons of the year.

There are five listed steelhead ESUs in the Columbia River Basin, which range from the lower river to the upper reaches of the Snake and Columbia rivers. Steelhead have either winter or summer run timing. Among the summer run steelhead, there are A-run and B-run populations that have different age, size, and run timing characteristics. One ESU has only winter run populations, two have both winter and summer run populations, and two more have only summer run populations. Management is further complicated by the fact that steelhead have protracted and overlapping run timing characteristics, which greatly limits our ability to assign fish caught in mixed stock fisheries to a particular ESU.

Given these circumstances fisheries have evolved, and our ESA consultation standards have developed, to focus management on identifiable stock groups during particular seasons that are considered "limiting" in the sense that they are weak stocks in need of protection. Winter, spring, and summer season fisheries (January 1- July 31) are managed as a block that is distinct from fall season fisheries (August 1 – December 31). For species other that steelhead, separation by season works in the sense that impacts occur either in one season or the other. For steelhead, run timing overlaps the seasons and there are no convenient breakpoints. The primary management constraint in non-Indian winter and spring fisheries are winter run steelhead that return primarily to the area below Bonneville Dam. Non-Indian fisheries during the late spring and summer are relatively limited, but do have some impacts on summer run steelhead. As a consequence, non-Indian winter, spring, and summer season fisheries are also subject to a 2% harvest rate limit on natural-origin summer run steelhead. Actual harvest rates have generally been substantially less than these summer run harvest rate limits. By the fall season, winter steelhead have cleared. Management of non-Indian fall season fisheries is therefore subject to a harvest rate limit on summer run steelhead of 2%.

Tribal fisheries are all located above Bonneville Dam. There are only a few winter run steelhead populations located above Bonneville Dam and few tribal fisheries until later in the spring after winter steelhead populations have cleared. As a consequence there are no specific constraints on winter run steelhead in tribal fisheries and the focus is on limiting impacts on summer run steelhead during the fall season, when most fishing occurs. As discussed in more detail below, the primarily ESA related limit to tribal fisheries is the 15% harvest rate limit on B-run steelhead.

Non-Indian winter and spring fisheries target hatchery origin spring chinook. The fishery is managed subject to specific harvest rate limits for listed spring Chinook and winter run steelhead. The states of Oregon and Washington proposed to increase the allowable harvest rate on winter run steelhead from 2% to 6% for 2005 only. The states based their proposed increase in harvest mortality largely on the proposition that the status of winter run steelhead has improved significantly over the last three to five years, and that given their improved status, the proposed increase would have a negligible impact on winter steelhead populations. NMFS concurred that winter steelhead populations had increased substantially over the last few years (by an average of 134% over the last four years), and that the increase was comprehensive, including most populations in the affected ESUs (see for example Tables 21 and 26). NMFS also considered whether differential timing of winter run steelhead populations would result in some populations being subject to higher harvest rates than others, but concluded that different populations were not likely to be subject to significant differences in harvest mortality as a result of the proposed fishery. NMFS' consideration of the states' proposal is reviewed in more detail in the supplemental biological opinion competed earlier this year (NMFS 2005).

Summer run steelhead are affected in spring and summer season fisheries as they begin to migrate into the Columbia River system, but most impacts occur during the fall season. Table 29 shows the take limits for each ESU that are used for managing the fisheries, and also the expected level of take for both the treaty and non-Indian fisheries. The non-Indian fisheries, for example, are subject to a 2% harvest rate limit on summer run steelhead in both the winter, spring, summer, and fall seasons (4% overall). However, the expected level of take for the year is substantially less, e.g., 1.0 – 1.8% for summer A-run steelhead. Overall impacts are therefore relatively limited.

Through the course of past consultations NMFS has considered previous efforts to reduce the level of harvest in both non-Indian and treaty Indian fisheries. The most significant management actions in non-Indian fisheries related to steelhead occurred 20 – 30 years ago. Commercial harvest of steelhead by non-Indians has been prohibited since 1975. Prior to efforts during the last few years to promote commercial selective fisheries, time, area, and gear restrictions limit handling and mortality of steelhead by the non-Indian gillnet fishery to less than 2% of the run. In addition, recreational anglers have been required to release unmarked, natural-origin steelhead in the Columbia River since 1986. Of the fish that are caught and released, it is assumed that 10% will die from resulting injuries.

Selective catch-and-release commercial fisheries have been promoted over the last three or four years to provide greater access to hatchery-origin spring Chinook. One of the changes has been to rely more on the use of small mesh tangle nets instead of the large mesh nets that steelhead were generally able to swim through because of their smaller size. Use of tangle nets results in more handling of steelhead, and thus the recent interest from the states in a higher take limit for winter run steelhead. The effect of tangle nets is mitigated to the degree possible by limiting the gillnet set duration, requiring the use of live boxes for resuscitating tangled fish and other management actions. The level of expected take on summer run steelhead associated with the non-Indian fisheries is shown in Table 29.

The primary limiting stock for managing tribal fisheries is B-run steelhead. As discussed in section 2.1.10 in some detail, B-run steelhead are a large and important component of the Snake River ESU that is at risk because of its current depressed status. B-run steelhead are also the component that is most vulnerable to the tribes' fall fisheries due to their later timing, larger size, and upstream location which requires them to pass through the full range of fall season fisheries. A-run steelhead, whether from the Snake River or other ESUs, benefit from the protections provide to B-run steelhead because they are subject to relatively lower harvest rates, again because of their smaller size, earlier timing, and, for the Lower Columbia River and Middle Columbia River ESUs, their downstream location. The winter run component of the Lower Columbia River and Middle Columbia River ESUs are also not subject to harvest in the fall season fisheries. B-run steelhead are therefore considered the most constraining of the steelhead stocks.

Tribal fall season fisheries are managed subject to a 15% harvest rate limit for B-run steelhead. The 15% harvest rate limit has been used for the last several years and considered in prior consultations (e.g., NMFS 2004a). As was the case with non-Indian fisheries, harvest mortality in tribal fisheries has been reduced substantially in response to evolving conservation concerns. Steelhead impacts associated with fall season fisheries were managed from 1986 to 1998 pursuant to the guidelines contained in the now expired CRFMP. That plan allowed for a tribal harvest rate on B-run steelhead during the fall season of 32%. The 32% cap was itself a reduced fishing level designed at the time to provide necessary protection to B-run steelhead. The average B-run harvest rate from 1985 to 1997 was 26.0% (Table 28). Since 1998, when ESA constraints specific to B-run steelhead were first applied, the harvest rate in the tribal fall season fishery has averaged 11.5%. The 15% harvest rate cap represents a 42% reduction from the long-term average harvest rate for the tribal fishery, and a 53% reduction from the CRFMP allowed harvest rate of 32%. The expected harvest rate on B-run steelhead in the tribes' 2005-2007 fisheries is 3.4-15%.

The harvest rate on Snake River A-run steelhead averaged 13.4% from 1985 to 1997. The average harvest rate over the last six years has been 5.2% (Table 28). The expected harvest rate on Snake River A-run steelhead in 2005-2007 is 4.5 to 10% (Table 29). It is therefore apparent that harvest in tribal fisheries has also been substantially reduced over the last 20 years or more.

As discussed in section 2.2.5 of this opinion, it is apparent that ocean conditions have improved since approximately 1999, and that many of the stocks have responded favorably to those changing conditions (see for example Tables 17, 18, 21, and 26). We cannot be sure that the improved conditions observed in recent years will persist. However, these conditions are more likely to persist if the recent observations portend a shift in the Pacific Decadal Oscillation. Improved conditions are not a substitute for sustained improvements in the freshwater habitat conditions, but will certainly help by providing the time necessary to bring the improvements on line.

For now NMFS is satisfied that steelhead harvest rates have been substantially reduced in recent years, and that the expected impacts associated with the proposed 2005 – 2007 Interim Management Agreement are sufficiently low to avoid jeopardizing the species. This conclusion is supported by recent upward runsize trends and apparently improved ocean conditions. Although the discussion and analysis in this biological opinion has focused to some degree on Snake River B-run steelhead, it is pertinent to recall that the expected harvest rates on other steelhead stocks are substantially lower (see Table 29).

NMFS, as a matter of policy, has sought not to eliminate harvest and, as discussed in this biological opinion and elsewhere, has accepted a certain measure of increased risk to the species to provide limited harvest opportunity, particularly to the tribes in recognition of their treaty rights and the Federal government's trust responsibility. Non-treaty fisheries are second in priority to tribal fisheries when it comes to fisheries that are limited by conservation constraints. But here too NMFS will seek, as a matter of policy, to provide some opportunity to access harvestable fish if the states and tribes can resolve critical questions related to allocation and with the proviso that the impacts are very limited and all possible measures are taken to minimize the incidental impacts to listed species. The implementation of steelhead mass marking and selective, non-retention fisheries by the Northwest states serves as an example. Even so, the associated impacts must be accounted for and held to acceptable levels.

NMFS believes that the harvest needs of the states and tribes during an interim period of recovery can best be achieved through a transition to selective fishery methods that can minimize the impacts to listed species and other weak stocks that require protection. NMFS' acceptance of the harvest rate standards for these three years provides an opportunity to make necessary adjustments in the fisheries with a minimum of disruption. But ultimately fisheries will be managed, and catch will continue to be limited, based on the needs of the listed fish. NMFS also believes that fisheries should be managed based on the status of the fish they affect. NMFS' objective is to develop a long-term abundance-based management plan that is more responsive to interannual changes in fish abundance. Once completed, the plan could provide the basis for a programmatic biological opinion that would cover the management of all *U.S. v. Oregon* fisheries for the foreseeable future. Based on these considerations, NMFS concludes that the impacts associated with the proposed 2005-2007 fisheries are not likely to appreciably reduce the likelihood of survival and recovery of Lower Columbia River, Middle Columbia River, Snake River, or Upper Columbia River steelhead ESUs.

6.0 CONCLUSION

After reviewing the current status of the listed ESUs considered in this biological opinion, the environmental baseline for the action area, the effects of the proposed fisheries, and the cumulative effects, it is NMFS' biological opinion that the proposed 2005-2007 fisheries are not likely to jeopardize the continued existence of the Upper Columbia River Chinook, Snake River spring/summer Chinook, Snake River fall Chinook, Upper Willamette River Chinook, Lower Columbia River Chinook, Columbia River chum salmon, Snake River sockeye, and Lower Columbia River coho salmon, or Lower Columbia River, Middle Columbia River, Upper Willamette River, Snake River, or Upper Columbia River steelhead ESUs.

The designated critical habitat for the Snake River spring, summer and fall Chinook ESUs and the essential habitat features for the other ESUs considered in the biological opinion are not substantially affected by the proposed fisheries. The activities considered in this consultation will therefore not result in the destruction or adverse modification of any of the essential features of designated critical habitat.

7.0 INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. " Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns, including breeding, feeding, or sheltering. "Harass" is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

The measures described below are non-discretionary; they must be undertaken by the action agency so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, in order for the exemption in section 7(o)(2) to apply. The action agencies have a continuing duty to regulate the activity covered in this incidental take statement. If the action agencies (1) fail to assume and implement the terms and conditions or (2) fail to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the agencies must report the progress of the action and its impact on the species to NMFS as specified in the incidental take statement. [50 CFR §402.14(i)(3)]

An incidental take statement specifies the amount of incidental take of endangered or threatened species associated with the action. It also provides reasonable and prudent measures that are necessary to minimize impacts and sets forth terms and conditions with which the action agency must comply in order to implement the reasonable and prudent measures.

7.1 Amount or Extent of Incidental Take Anticipated

NMFS anticipates that the ESA listed species will be taken as a result of fall season fisheries. The incidental take occurs as a result of catch and retention, or mortalities resulting from catch and release, or mortalities resulting from encounter with fishing gear, as a consequence of fishing activity. The amount of anticipated take is listed in Table 26, and expressed below in terms of harvest rates.

7.1.1 Chinook Salmon

<u>Snake River fall Chinook</u>
The maximum allowed harvest rate for Snake River fall Chinook salmon is 31.29%. The expected harvest rates on Snake River fall Chinook in proposed non-Indian and treaty Indian fisheries are 8.25% and 23.04%, respectively. However, this distribution of harvest impacts may vary inseason.

<u>Snake River spring/summer Chinook and Upper Columbia River Chinook</u>
Non-Indian and treaty Indian harvest rates on natural-origin Snake River spring/summer Chinook and Upper Columbia River Chinook will vary depending on runsize as shown in Table 30, but under no circumstances should they exceed of 2% and 15%, respectively. The combined range of possible harvest rates for natural-origin Snake River spring/summer Chinook and Upper Columbia River Chinook is from 5.5% to 17% (see Table 30).

<u>Lower Columbia River Chinook</u>
The expected harvest rate in the non-Indian fisheries on the spring component of the Lower Columbia River ESUs is from 0.2 to 2.0%. Harvest rates on the tule and bright components of the Lower Columbia River chinook ESU in the non-Indian fisheries are expected to range from

7.3 to 12%, and from 9.5 to 18.8%, respectively. However, harvest rates to the Lower Columbia River tule component are subject to a combined ocean and inriver RER for Lower Columbia River tules of 49%. Tribal fisheries are not expected to affect Lower Columbia River Chinook. The expected harvest rate in treaty Indian fisheries on Lower Columbia River Chinook is zero.

<u>Upper Willamette River Chinook</u>
Non-Indian fisheries on Willamette spring Chinook in the mainstem Columbia River and Willamette River combined are managed consistent with the fishery management plan submitted to the NMFS by ODFW titled "Fisheries Management and Evaluation Plan, Upper Willamette Spring Chinook in Freshwater Fisheries of the Willamette Basin and Lower Columbia River Mainstem" (ODFW 2001), and subject to a 15% harvest rate limit (LeFleur 2005a, LeFleur 2005b, Table 23). The harvest rate from non-Indian Columbia and Willamette river fisheries on natural-origin spring Chinook are expected to range from 5-11% over the course of the 2005-2007 Agreement. No take of Upper Willamette spring Chinook is expected in treaty Indian fisheries.

7.1.2 Columbia River Chum Salmon

The harvest rate on Columbia River chum from the proposed non-Indian fishery is limited to no more than 5%, with an expected incidental harvest rate of 1.6%. No take of Columbia River chum is expected in treaty Indian fisheries.

7.1.3 Lower Columbia Coho Salmon

The harvest rate on Lower Columbia Rive coho in non-Indian fisheries is expected to be no more than 6.5%, which would include a 7.3% harvest rate on the early component and a 0.9% harvest rate on the late component. No take of Lower Columbia River coho is expected in treaty Indian fisheries.

7.1.4 Snake River Sockeye

The non-Indian fisheries and tribal fisheries will be managed according to the harvest rate schedule shown in Table 31. The expected harvest rate for Snake River sockeye for 2005-2007 range from 0 to 1.0%, and from 2.8 to 7.0% for non-Indian and treaty Indian fisheries, respectively.

7.1.5 Steelhead

The harvest rate limit in 2005 for non-Indian fisheries for the aggregate of winter run populations returning to the Lower Columbia River, Middle Columbia River, and Upper Willamette Rivers steelhead ESUs is 6%. The harvest rate limit for winter-run steelhead for 2006 and 2007 is not yet determined and will be the subject of future consultation prior to the 2006 fishing winter/spring fishing season.

Non-Indian winter, spring, and summer season fisheries are also subject to a 2% harvest rate limit on natural-origin summer run steelhead, from all ESUs. Non-Indian fisheries in the fall season are subject to an additional harvest rate limit on summer run steelhead of 2%. The harvest limit on summer steelhead in non-Indian fisheries is therefore 4% per year, for all ESUs. The expected harvest rates for the summer component of Lower Columbia River and Middle Columbia River steelhead in non-Indian fisheries during 2005-2007 range from 0.6 to 1.6% and 1 from 1.0 to 1.8%, respectively. The expected harvest rates for the natural-origin and hatchery-origin components of the Upper Columbia River steelhead ESU in non-Indian fisheries during 2005-2007 range from 1.0 to 1.8% and 8.6-15.0%, respectively.

The harvest rate for treaty Indian fisheries on the winter component of the Lower Columbia River located above Bonneville Dam, and the winter component of the Middle Columbia River steelhead is expected to range from 0.6 to 10.7%. The harvest rates for treaty Indian fisheries on the summer component of the Lower Columbia River located above Bonneville Dam and the sujmer component of the Middle Columbia River steelhead is expected to range from 3.5 to 8.2%. The expected harvest rates for treaty Indian fisheries on Upper Columbia River natural and hatchery-origin steelhead is expected to range from 3.5% to 8.2%, for both components. The harvest rates on Snake River A-run and B-run steelhead are expected to range from 3.5 to 8.2% and from 3.4 to 15.0%, respectively. These harvest rates may increase or decrease in season, but are limited by the treaty Indian incidental harvest rate on Snake River B-run steelhead during fall season fisheries that may not exceed 15%.

7.2 Effect of the Take

In this biological opinion, NMFS has determined that the level of take anticipated is not likely to jeopardize the continued existence of ESA listed salmonid species or result in the destruction or adverse modification of designated critical habitat.

7.3 Reasonable and Prudent Measures

NMFS concludes that the following reasonable and prudent measures are necessary and appropriate to minimize the impacts from fisheries considered in this biological opinion to listed steelhead and salmon ESUs.

1. The Washington Department of Fish and Wildlife (WDFW) shall monitor the passage of salmonids at Columbia River dams. The TAC shall provide necessary inseason estimates of run size.

2. The WDFW and the Oregon Department of Fish and Wildlife (ODFW) shall monitor the catch for recreational and commercial fisheries in Zones 1-6.

3. The WDFW and the ODFW shall sample the recreational and commercial fisheries in Zones 1-6 for stock composition.

4. The Columbia River Inter-tribal Fish Commission (CRITFC) and its member tribes shall monitor the catch in all tribal ceremonial and subsistence (C&S) fisheries and platform fisheries, and in commercial fisheries in cooperation with the monitoring efforts of the states.

5. The CRITFC and its member tribes shall sample the Zone 6 C&S fishery sufficient for stock composition.

6. The TAC shall account for the catch of each fishery as it occurs through the season and report to NMFS the results of these monitoring activities and, in particular, any anticipated or actual increases in the incidental harvest rates of listed species from those expected preseason.

7.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the action agencies must ensure that the tribes and states comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. The WDFW shall obtain daily counts of all salmonids passing Bonneville, The Dalles, John Day, and McNary dams. The TAC shall use dam counts and other available information to develop inseason updates to run size estimates for fall Chinook and steelhead.

2. Monitoring of catch in the recreational and Zone 1-6 commercial fisheries by WDFW and ODFW shall be sufficient to provide statistically valid estimates of the salmon and steelhead catch. Sampling of the commercial catch shall entail daily contact with buyers regarding the catch of the previous day. The recreational fishery shall be sampled using effort surveys and suitable measures of catch rate.

3. The WDFW and the ODFW shall sample the stock composition of the recreational fisheries and Zone 1-6 commercial fisheries at a sampling rate of 20%.

4. Monitoring of catch in the Zone 6 fisheries by CRITFC and its member tribes shall be sufficient to provide statistically valid estimates of the catch of salmon and steelhead. The catch monitoring program shall be stratified to include platform, hook-and-line, and gillnet fishery components.

5. The CRITFC and its member tribes shall sample the stock composition of the Zone 6 C&S fisheries at a sampling rate of 20%.

6. The TAC shall account for the daily catch of each fishery through the season. If it becomes apparent inseason that any of the established harvest rate limits may be exceeded due to catch or revisions in the run-size projection, then the states and tribes shall take additional management measures to reduce the anticipated catch as needed to conform to the limits.

8.0 CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of threatened and endangered species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. NMFS believes the following conservation recommendations should be implemented:

1. Restrictions on harvest for protection of natural-origin steelhead will reduce the tribes' ability to access harvestable fall Chinook and hatchery steelhead using traditional fishing methods. The *U.S. v Oregon* parties, including the federal government, the tribes, and the states, should work to develop alternative fishing methods that reduce impacts to wild steelhead while more selectively targeting harvestable stocks. The alternative is to limit mixed stock fisheries according to the conservation needs of the weak stocks and thereby forego the catch of otherwise harvestable fish. Methods to be evaluated should include, but not necessarily be limited to:

a. Modifications to net types used in the mainstem Columbia River, with the intent to either avoid the encounter of certain species through maximum or minimum mesh size regulations, or to increase the ability to release nontarget fish unharmed through use of tangle nets, tooth nets, or other similar gear. A multi-year fishery evaluation by the Yakama Indian Nation suggests that the use of minimum mesh size regulation may be quite effective in selectively catching Chinook salmon while reducing impacts to steelhead in mainstem fisheries. Available information suggests that the use of "weed-line" gear which incorporates a panel of large mesh at the top of a gillnet is effective in avoiding steelhead which migrate close to the surface. Recent studies on the use of tooth nets for selective commercial harvest indicate catch-and-release survival rates are low enough at least during spring season fisheries to provide fisheries and conservation benefits. These and other similar approaches should be evaluated. Funding needs for research and, if warranted, implementation, and appropriate funding sources, should be identified.
b. Catch-and-release of unmarked steelhead should be implemented in tribal dipnet and hoopnet fisheries. In the 1998 mainstem Columbia River fall season fishery, an estimated 42 wild-A and 380 wild-B steelhead were taken in the treaty Indian platform ceremonial and subsistence fishery. Had the platform fishery been implemented with a regulation requiring live release of unmarked steelhead, a savings of approximately 2½ percentage points in the overall wild-B steelhead harvest rate would have resulted. Additional opportunities for dipnet and hoopnet fisheries in tributary areas, particularly in areas with runs dominated by hatchery returns, should be sought or developed, with the additional benefit that such sites are likely to be much closer to or actually on tribal lands.
c. The potential use of fish traps and fish wheels, or other live capture methods, in the mainstem Columbia River, in off-mainstem areas, and in tributaries should be carefully considered. In some cases, both technical and regulatory constraints to the use of such gear exist. In particular, the potential catch of traps and fish wheels is highly site-

specific, and appropriate locations in the mainstem may not exist. However, the high selectivity of such gear, including the extremely low mortality rates apparently associated with catch-and-release of nontarget species indicate that such gear types merit further evaluation.

2. The mortality risks associated with the handling and live release of salmonids in fisheries are exacerbated by stresses associated with warm water conditions. At water temperatures above approximately 70˚ F, biological functions are impaired and fish die as a direct result of high temperatures (Environmental Protection Agency 1971). Even at somewhat lower temperatures, while salmon may not suffer significant mortalities as a direct result of handling, metabolic stresses increase the susceptibility of individuals to other adverse effects, and additional stresses from other sources which cumulatively increase the likelihood of mortality (Wilkie et al. 1996; Wydoski et al. 1976; Bell 1990). The probability of hooking mortality of adult summer steelhead angled in the Mad and North Fork Trinity Rivers increased markedly (from less than 5% to nearly 45%) when water temperatures increased from 18˚C to 25˚C (G. Taylor, ODFW, pers. comm., to H. Pollard, NMFS, August 17, 1998). Mortality of rainbow trout played to exhaustion has been shown to significantly increase with increases in water temperature (Dotson 1982).

An additional concern associated with high mainstem water temperatures involves fisheries in cold water refugia, such as the mouths of Herman Creek and the Klickitat River and Drano Lake. Current recreational fishery regulations based on average estimated encounter rates may be substantially in error when actual encounter rates in fisheries with significant effort are much higher. When water temperatures in larger river mainstems increase, upstream-migrating adult salmonids "dip in" to the mouth of tributaries, where temperatures are lower. The fish concentrate in these areas and hold until mainstem temperatures begin to decrease. As a result of the assemblages of fish, fisheries also tend to intensify in these tributary areas, with several potential adverse effects: the fisheries are more concentrated; the hooking rate per fish may increase; and the fish are already likely to be debilitated from warm water effects. The resultant damage to migrating stocks of salmonids is potentially high, and may require significant reduction of fishing in these refugia areas during adult migration to protect spawning escapements upstream.

The extent to which warm water actually increases mortality rates in Columbia River fisheries is unclear, but significant benefits to salmonid rebuilding and recovery may be available through additional fishery management actions designed to address high water temperatures. For example, in response to similar concerns, the State of Maine's Conservation Plan recommends that catch-and-release fisheries on Atlantic salmon be closed during periods of water temperatures in excess of 68˚F (20˚C)(The Maine Atlantic Salmon Task Force 1997). The U.S. v. Oregon Federal, tribal, and state fishery co-managers should explore and develop actions addressing the following concerns:

a. The Federal, tribal, and state fishery agencies should compile and evaluate existing data on temperature effects on salmonid survival, and identify and implement additional research needed to identify whether fishery constraints during warm water periods are warranted, and, if so, at what temperature such constraints should be applied.

b. The states of Oregon, Washington, and Idaho should explore criteria for application and the potential for recreational fishery regulations restricting fisheries during periods of excessively high water temperatures. The tribes should explore similar criteria for tribal gillnet restrictions during periods of warm water, to decrease mortalities accruing to non-target steelhead encountering but escaping from gillnets, particularly large-mesh nets used to reduce impacts to steelhead.

c. The tribes and states should consider closing all cold water refugia to fishing activities during periods of excessively high mainstem water temperatures.

d. The parties should develop information outreach programs to instruct fishers on the implications of fishing during warm water conditions. This education should address the need to reduce fight time and other undue sources of fishing stress by landing fish quicker, using gear of greater strength, and by leaving in the water any fish intended to be released.

9.0 REINITIATION OF CONSULTATION

This concludes formal consultation on the for year-round *U.S. v. Oregon* fisheries in the Columbia River basin in 2005-2007, and the associated Interim Management Agreement . As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; (4) a new species is listed or critical habitat designated that may be affected by the identified action.

NMFS finds the management constraints contained in this biological opinion necessary for the conservation of the affected listed species. In arriving at these management constraints, NMFS has been mindful of affected treaty rights and its Federal trust obligations. NMFS will reconsider the management constraints in this biological opinion that affect treaty rights in the event new information indicates such reconsideration is warranted.

This concludes the conference on the 2005 fisheries in the Columbia River Basin on Lower Columbia River coho salmon ESU. NMFS may be asked to confirm the conference opinion as a biological opinion through formal consultation if Lower Columbia River coho salmon is listed or critical habitat designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further consultation will be necessary.

After a listing of Lower Columbia River coho salmon as endangered/threatened and/or designation of its critical habitat, and any subsequent adoption of this conference opinion, the Federal agency shall request reinitiation of consultation if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in the conference opinion; (3) the agency action is subsequently modified in a manner that causes the effects to Lower Columbia River coho salmon or its critical habitat that was not considered in the conference opinion; or (4) new species is listed or critical habitat designated that may be affected by the action.

The incidental take statement provided in this conference opinion does not become effective until Lower Columbia River coho salmon is listed and the conference opinion is adopted as the biological opinion issued through formal consultation. At that time, the proposed fisheries will be reviewed to determine whether any take of Lower Columbia River coho salmon or adverse modification of its critical habitat has occurred. Modification of the opinion and incidental take statement may be appropriate to reflect that take. No take of Lower Columbia River coho salmon or adverse modification of its critical habitat may occur between the effective date of its listing and the adoption of the conference opinion through formal consultation, or the completion of a subsequent formal consultation.

10.0 MAGNUSON-STEVENS ACT ESSENTIAL FISH HABITAT CONSULTATION

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (§305(b)(2));
- NMFS must provide conservation recommendations for any Federal or State action that would adversely affect EFH (§305(b)(4)(A)); and
- Federal agencies must provide a detailed response in writing to NMFS within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NMFS EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (§305(b)(4)(B)).

EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA §3). For the purpose of interpreting this definition of EFH: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.10). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (*e.g.*, contamination or physical disruption), indirect (*e.g.*, loss of prey or reduction in species fecundity), site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

EFH consultation with NMFS is required regarding any Federal agency action that may adversely affect EFH, including actions that occur outside EFH, such as upstream and upslope activities that may adversely affect EFH.

The objectives of this EFH consultation are to determine whether the proposed action would adversely affect designated EFH and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH.

10.1 Identification of Essential Fish Habitat

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated EFH for three species of federally-managed Pacific salmon: Chinook (*O. tshawytscha*); coho (*O. kisutch*); and Puget Sound pink salmon (*O. gorbuscha*)(PFMC 1999). Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC 1999), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years). Detailed descriptions and identifications of EFH for salmon are found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999). Assessment of potential adverse effects to these species' EFH from the proposed action is based, in part, on this information.

10.2 Proposed Action and Action Area

For this EFH consultation, the proposed action and action area are as described in detail above. The proposed action is agreement among the U.S. v. Oregon Parties regarding the 2005-2007 Interim Management Agreement, and the issuance of an incidental take statement pursuant to section 7 of the ESA with respect to 2005-2007 fisheries in the Columbia River basin as proposed by the Parties. The action area includes the Columbia River from its mouth upstream to the Wanapum Dam, including its tributaries (with the exception of the Willamette River). The action area includes habitats that have been designated as EFH for various life-history stages of Chinook and coho salmon. A more detailed description and identification of EFH for salmon is found in Appendix A to Amendment 14 to the Pacific Coast Salmon Plan (PFMC 1999).

Assessment of the impacts on these species' EFH from the above proposed action is based on this information.

10.3 Effects of the Proposed Action

While harvest related activities do affect passage in that fish are intercepted, those impacts are accounted for explicitly in the ESA analyses regarding harvest related mortality. Most of the harvest related activities occur from boats or along river banks. Gears that are used include primarily hook-and-line, drift and set gillnets, and hoop nets that do not substantially affect the habitat. There will be minimal disturbance to vegetation, and negligible harm to spawning or rearing habitat, or to water quantity and water quality, particularly since most of the fishing activity occurs in Zones 1-6 on the Lower mainstem Columbia River. Thus, there will be minimal effects on the essential habitat features of the affected species from the action discussed in this biological opinion, certainly not enough to contribute to a decline in the values of the habitat.

10.4 Conclusion

Using the best scientific information, including information supplied by the TAC, NMFS' analysis in the above ESA consultation, as well as the foregoing EFH sections, NMFS has determined that the proposed action is not likely to adversely affect designated Pacific salmon EFH.

10.5 EFH Conservation Recommendation

Pursuant to Section 305(b)(4)(A) of the MSA, NMFS is required to provide EFH conservation recommendations to Federal agencies regarding actions which may adversely affect EFH. Because NMFS concludes that the proposed Federal action would not adversely affect designated EFH, it will not issue additional specific conservation recommendations.

10.6 Statutory Response Requirement

Because there are no conservation recommendations, there are no statutory response requirements.

10.7 Consultation Renewal

NMFS must reinitiate EFH consultation if the proposed 2005-2007 fisheries in the Columbia River basin are substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for the EFH conservation recommendations (50 CFR Section 600.920(k)).

11.0 DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) ("Data Quality Act") specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Biological Opinion addresses these DQA components, documents compliance with the Data Quality Act, and certifies that this Biological Opinion has undergone pre-dissemination review.

Utility: This ESA section 7 consultation on proposed *U.S. v. Oregon* 2005-2007 fisheries in the Columbia River will not jeopardize the affected ESUs. NMFS can therefore write a no-jeopardy Biological Opinion exempting from prohibition the incidental take of ESA-listed species during conduct of this suite of fisheries in accordance with the 2005-2007 Interim Management Agreement (*U.S. v Oregon* Parties 2005). The intended users are the *U.S. v Oregon* Parties and their respective communities. Tribal members, recreational fishers and associated businesses, commercial fishers, fish buyers and related food service industries, and the general public benefit from the consultation.

Copies of the Biological Opinion were provided to the *U.S. v Oregon* Parties. This consultation will be posted on the NMFS NW Region web site (*www.nwr.noaa.gov*). The format and naming adheres to conventional standards for style.

Integrity: This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, "Security of Automated Information Resources," Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased, and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA Regulations (50 CFR 402.01 et seq.), and the Magnuson-Stevens Fishery Conservation and Management Act (MSA) implementing regulations regarding Essential Fish Habitat (50 CFR 600.920(j)).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this Biological Opinion/EFH consultation contain more background on information sources and quality.

***Referencing*:** All supporting materials, information, data, and analyses are properly referenced, consistent with standard scientific referencing style.

Consultation Number: F/NWR/2005/00388

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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